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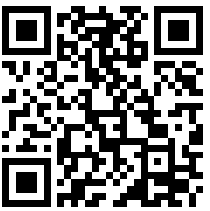

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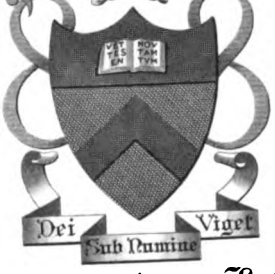

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VOL. XLII.

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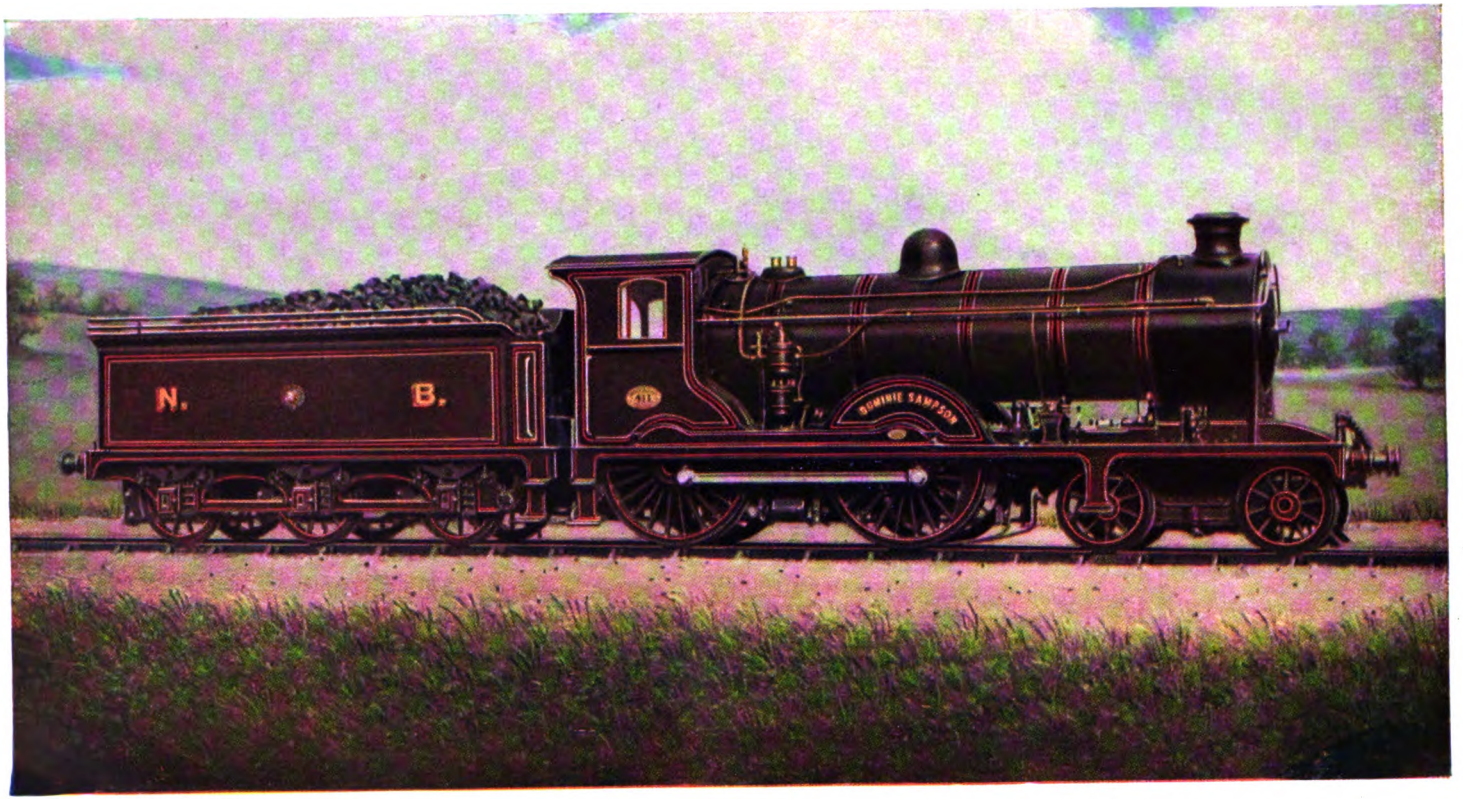

THE RAILWAY MAGAZINE.

NORTH BRITISH RAILWAY 4-4-0 Superheated Main Line Engine, No. 411, *Dominie Sampson.*

Designed by Mr. W. P. Reid, Locomotive Superintendent, and built at Cowlairs Works.
Fitted with Wakefield Patent Mechanical Lubricator.
Cylinders: 20 in. diameter, 26 in. stroke. Coupled wheels: 6 ft. 6 in. diameter.
Bogie wheels: 3 ft. 6 in. diameter. Steam pressure: 170 lbs. per sq. in.
Heating surface: Tubes, 136 tubes, 1⅞ in. external diameter, 779·4 sq. ft.; 24 tubes 5 in. external diameter, 366·4 sq. ft.;
Superheater (Robinson type), 355·2 sq. ft.; firebox: 139·7 sq. ft.; total, 1,640·7 sq. ft.
Area of grate: 21·13 sq. ft. Coal capacity: 7 tons. Water capacity: 4,235 gallons.
Weight of engine and tender in working order: 104 tons 9 cwt. 1 qr.

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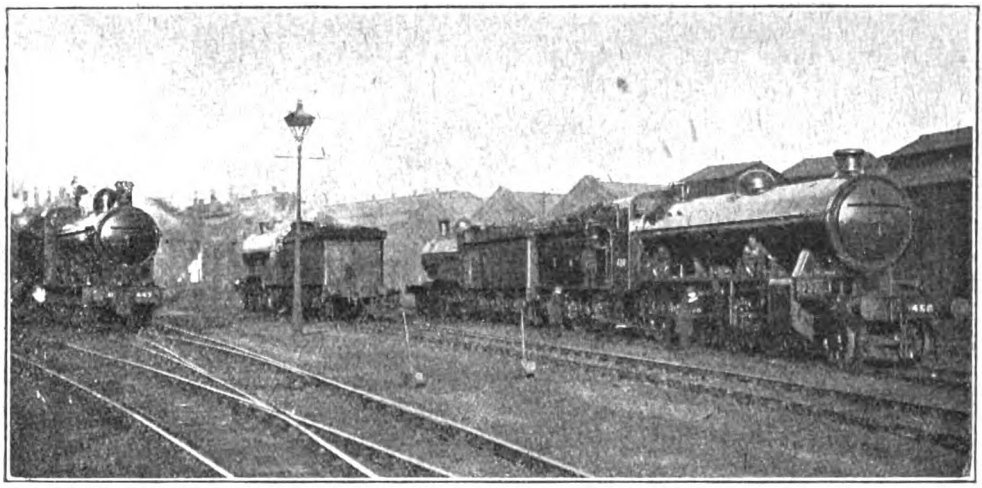

GREAT NORTHERN RAILWAY LOCOMOTIVE YARD AT NEW ENGLAND.
Four different types of engines are here illustrated.

The Locomotive Depot of the Great Northern Railway at New England, Peterborough.

By CHAS. S. LAKE, M.Inst.L.E.

PETERBOROUGH represents an important locomotive and traffic centre on the Great Northern Railway system. Immediately north of the passenger station there are, on the east, or up, side of the main line, extensive marshalling sidings, whilst in the district known as New England, about one mile north of the station, locomotive running sheds and shops are located on a wide area of ground planned with all the necessary features of an important locomotive depôt.

Peterborough is classified as the No. 2 district in the locomotive working arrangements of the Company. Its ramifications extend from Biggleswade South to Little Bytham in the north with the Ramsey, Stamford and Bourne branches, and inclusive also of the Lincolnshire district lines to Willoughby, taking in the Skegness and Spilsby branches, a total mileage of 193. Boston is a sub-depôt to Peterborough and the locomotives stationed there work over the Lincolnshire district lines. In addition to the main locomotive running sheds at New England there is a small engine shed alongside the passenger station at Peterborough on the east or up side. Originally eight engines were stabled in this shed and they worked on the Lincolnshire loop line, which latter leaves the main line at Werrington Junction about two miles north of New England and rejoins it at Doncaster. The locomotives referred to were originally of the 2–4–0 type with inside cylinders 17 in. diameter by 24 in. stroke and 7 ft. driving wheels. They were Sturrock engines built by outside firms in the years 1866 and 1867 or thereabouts. They were subsequently rebuilt at Doncaster as single driver locomotives with the same driving wheels, but with new frames and 4 ft. 3 in. trailing wheels. About 15 years ago a commencement was made with the transference of these locomotives to New England at the time when a new coaling stage, of which an illustration appears on page 3, was erected. A small coaling stage with hand cranes is still located at the old shed, but the shed itself is now used for stabling breakdown cranes and locomotives waiting their turn for taking on trains. Carriage and wagon repairs are carried out in shops adjacent to the old shed and station.

The number of locomotives belonging to the Peterborough district is 251. Of these 207 are actually shedded at New England and of the remainder 38 are at Boston, three at Stamford, two at Wainfleet and one at Spilsby. The five heavy coal engines of the

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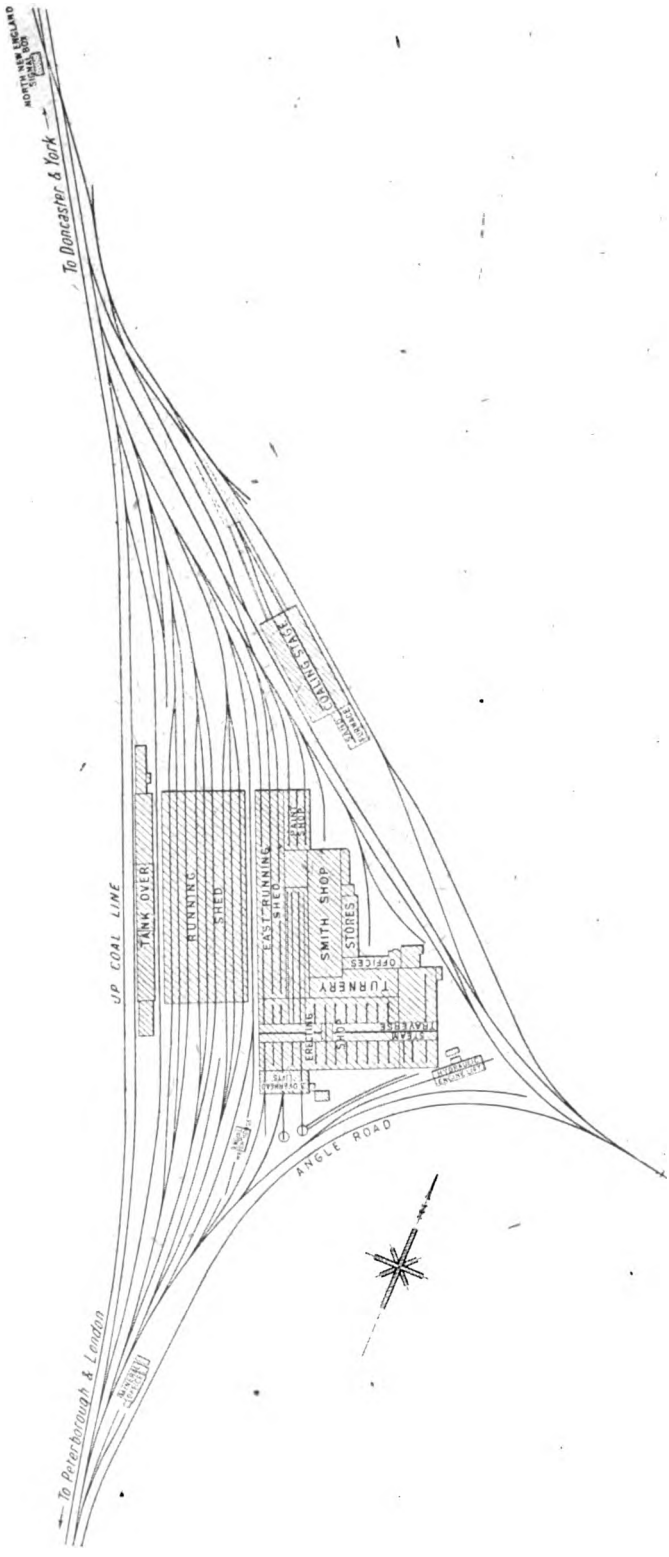

PLAN SHOWING LAY-OUT OF GREAT NORTHERN RAILWAY LOCOMOTIVE DEPOT, NEW ENGLAND, PETERBOROUGH.

2–8–0 type are all stationed at New England and there are also ten of Mr. Gresley's 2–6–0 type engines there. In addition, the number 1300 engine, built by the Vulcan Foundry in 1905 for the Great Northern Railway, is a Peterborough engine. This locomotive was originally a four-cylinder compound but it has recently been rebuilt at the Doncaster works as a two-cylinder simple engine.

The stabling capacity of the New England running sheds is 72 engines of different types and at Boston the sheds accommodate 18 locomotives. In round figures 120 locomotives are in steam daily at New England and 30 at Boston. At one time Peterborough provided engines for all traffic, both passenger and goods, running between there and London. In those days only about two trains ran through without stopping, but with the introduction of long distance non-stopping trains, reorganisation became necessary and the trains were consequently engined at London, Grantham or Doncaster. It is interesting to note in passing that Boston was originally the locomotive headquarters of the Great Northern Railway. The opening of the system to that town was completed on October 17th, 1848. Peterborough was originally of little importance from the railway point of view and the

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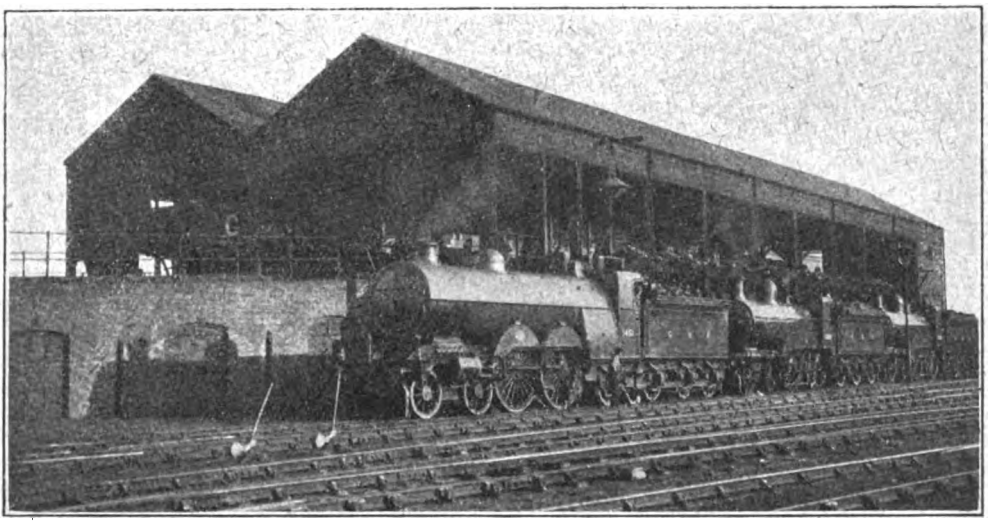
main line was planned to pass directly through Stamford. The then Marquis of Exeter, however, opposed the project and the line was, as a consequence, carried through Peterborough to Grantham. The Marquis subsequently realised his error in opposing the railway scheme, and later built a line of his own from Stamford to Essendine. The locomotives first used for working this branch line, which has a length of four miles, were tank engines with 15 in. by 20 in. cylinders. They were eventually taken over by the Great Northern Railway and the line itself worked by the Company.

The District Locomotive Superintendents who have successively had charge of the Peterborough district included men whose names subsequently became prominent in railway locomotive engineering in this country. Charles Sacrè, who afterwards became Locomotive Superintendent of the Manchester, Sheffield and Lincolnshire Railway, was at one time the chief at New England and similarly Samuel W. Johnson, who later became Locomotive Engineer of the Midland Railway at Derby, for a time held the same position there. Mr. F. Rouse, J.P., had charge for about 30 years and the post of District Locomotive Superintendent is now held by Mr. Herbert Sinclair, whose connection with the Great Northern Railway extends over many years. For a time he was foreman at the Carr locomotive sheds, Doncaster, and subsequently acted as assistant at King's Cross. From there he went to the new locomotive depôt at Hornsey as assistant and later became district Locomotive Superintendent in the West Riding district, finally taking charge at New England in the year 1907. Mr. Sinclair has served under three successive Locomotive Chiefs on the Great Northern Railway, namely, Messrs. Patrick Stirling, H. A. Ivatt and H. N. Gresley.

New England was constituted a railway centre in or about the year 1848, at which time the district was practically unpopulated. The Company built houses for their workpeople; also a church and school. These houses have been added to from time to time as the number of employees has grown and they now number 220, whilst in addition an Institute, equipped with recreation and reading rooms and library, has been provided. There is also an Institution class or lecture room equipped with full size models of locomotive valve gears, brake apparatus, injectors, etc., whilst large sized charts and diagrams are exhibited on the walls showing the details of the various mechanisms. Lectures are given periodically in this room by practical men for the instruction of the locomotive employees. The Institution is provided by the Company and managed by a Committee elected by the subscribers, who pay a nominal fee of 1s. per annum for membership. The church referred to above has been taken over by the Ecclesiastical



THE ELEVATED COAL STAGE AT NEW ENGLAND.
Engines being coaled.

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authorities, whilst the Peterborough Municipal authorities have built more modern schools for the use of the district. The Institute is now accommodated in what were originally the school buildings.

The running sheds have been added to from time to time. They now consist of three separate sheds, one containing six roads for goods and coal engines, whilst the next has three roads where, for the most part, locomotives of the 4–4–0 type are stationed. The east running shed is reserved for "Atlantic" type engines. It contains three roads. As the diagram drawing on page 2 shows, the main running shed is of the through type, that is to say, locomotives can pass through it from one end to the other from the yards north and south of the shed, whilst there are through tracks outside the building on both the east and west sides. These are the up and down engine lines to Peterborough station. They connect with the main lines at both ends and also inter-connect with the various yards at New England. The sheds are all of the same length, namely, about 300 ft. The main or through running sheds are collectively about 120 ft. in width. All the roads are fitted with engine pits. The sheds and shops are illuminated by means of coal gas manufactured by the Company, the plant being located at New England.

The water for the locomotives is obtained from three artesian bores at Werrington Junction, where also track water troughs are laid along the main line. Pumping is performed by three Worthington pumps, which deliver water into an overhead tank of 128,000 gallons capacity. This, as the plan drawing shows, is located on the west side of the running sheds. It is built on brick walls enclosing what originally was a sand store and furnace, but is now used as bricklayers' stores, whilst it also contains the plant known as Economical boiler washing apparatus. The principle upon which this plant is operated is briefly as follows:—A locomotive is brought in with from 60 to 100 lbs. of steam pressure still in the boiler. By means of a flexible metallic hose pipe a connection is made between the patent blow off cock fitted to the engine and the blow off line of piping to the tanks of the boiler washing system, which contain the hot water for washing out and filling. The engine is then blown off and the water and steam pass away to a separator on the top of the tank containing the washing out water. The water falls down through a coke filter bed, which latter arrests any scale, into the tank and the steam passes off through a pipe to a chamber on the top of the tank which contains the filling water, where it meets pure

TOP LANDING OF THE ELEVATED COAL STAGE.

The coal is transferred from the trucks to hand trolleys, and from the latter to tenders of engines standing below.

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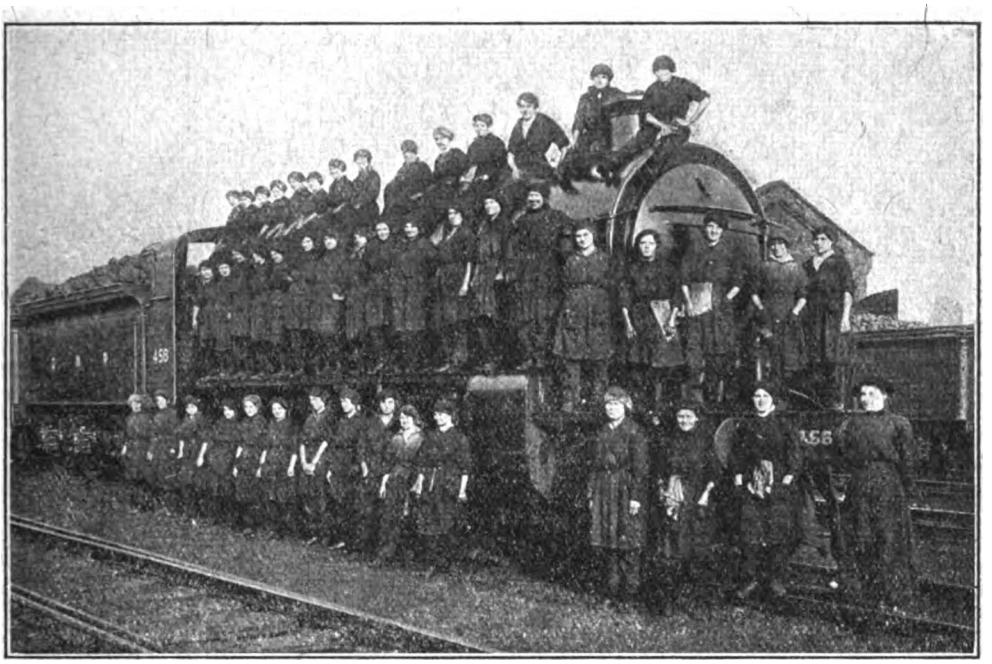
cold water from the main water supply. This water is heated up by the steam and falls into the tank. When the engine has been fully blown off, which occupies from 10 to 20 min., according to the size of the boiler, the blow off hose is disconnected and an armoured hose wash-out pipe is coupled to another line of piping through which the water from the wash-out tank is pumped. The engine is then washed out in the usual manner. All deposits drop into the mud collector, from which they are carried away to the sewer. A duplex Worthington pump is employed for pumping the washing-out water and this is automatically controlled so as to yield a pressure of 60 lbs. per sq. in. A second pump maintains the fresh water supply. By means of a thermostatic valve the temperature of the wash-out water is maintained at 140 deg. F., which is as high a temperature as can be conveniently handled by the men engaged in washing out. When the washing-out process has been completed and all the plugs, glands and mud hole doors have been replaced the hose is shifted on to another line of piping and the boiler replenished from the filling tank with water at not less than 180 deg. F., this being pumped from the filling tank by a duplex pump similar to the one referred to above. A thermostatic valve automatically opens a valve to supply live steam for heating, purposes to the filling tank, when the temperature of the water in it falls below 180 deg. F. and automatically shuts off the supply of steam when the required temperature is reached. The waste steam from the engines which are blown off is, however, usually sufficient to give the minimum degree of heat required to the water in the filling tank and it is rarely necessary to call on the live steam for that purpose. The system is thoroughly automatic and requires no attention whatever.

The water delivered by the pumps at Werrington passes through a water softening plant before reaching the 128,000 gallon tank and it is delivered from the tank to the water cranes, of which there are a large number, some of them being located at New England and others at Peterborough station. The tank also supplies the Company's premises with water in the immediate district, the houses, however, being supplied from the public mains.



GROUP OF GREAT NORTHERN RAILWAY WAR-TIME ENGINE CLEANERS.

On referring to the plan it will be seen that the coaling stage with sand furnace is located slightly to the north of the other buildings on the east side of the yards. It consists of an elevated coal stage with two

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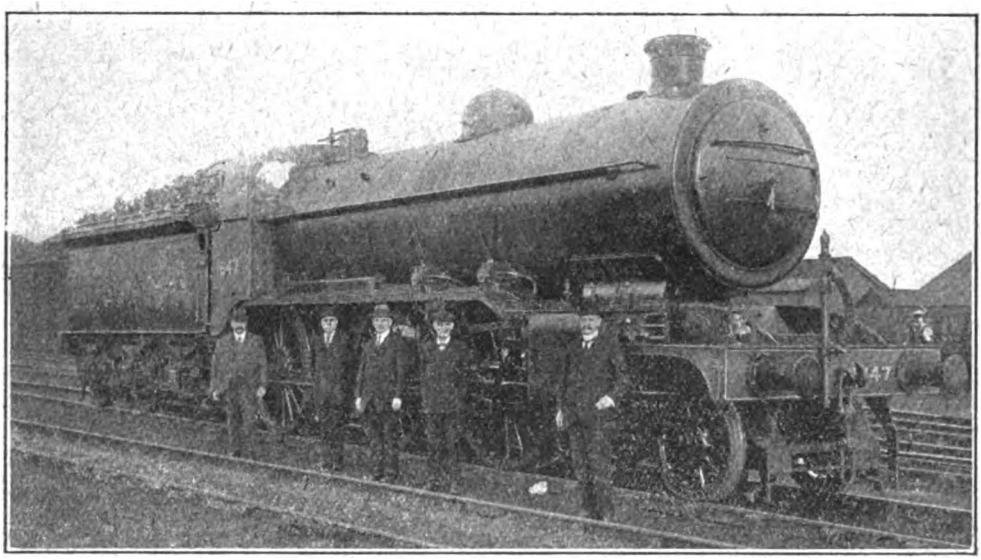
lines of track. It is approached from the north by an inclined track and the stage is protected by roofing. Five wagons can be accommodated on each road, the majority of them being 15 or 20 ton vehicles. The locomotives after passing over the ash-pit move forward to the coal stage and the illustration on page 3 shows an "Atlantic" type engine of the 251 class, *i.e.*, No. 1451, and two 4-4-0 express locomotives alongside the stage. The passenger engines are drawn up on the west side of the stage and goods engines on the east. A superior quality of coal is delivered from the west side for use in the passenger engine tenders. The coal is transferred from the wagons, in which it is conveyed up the inclined way to the elevated level, to 5 and 10 cwt. metal barrows or trolleys, and it is tipped from these latter on to the tenders of the locomotives. The drop is a small one, as a chute is interposed between the barrow and the tender. A standard Great Northern Railway locomotive tender of the largest size can be coaled in the space of from 5 to 10 min. by the means adopted, and even this does not represent the minimum time in which it would be possible to carry out the operation. The amount of coal moved at the stage per week is about 2,600 tons.

The erecting shop, as seen in the plan drawing, runs east and west in its length. The centre portion is occupied by a steam traverser, the run-way being 250 ft. long by 25 ft. wide. The traverser is propelled by a small stationary engine with vertical multitubular boiler. There are 16 transverse engine repair pits on the south side, and 13 similar pits on the north side of the traverser. At the east end of the erecting shop there is an annexe used as a tender repair and wheel turning shop.

The work done in the erecting shed consists mainly of running repairs to locomotives, although in times past heavy repairs were undertaken at the depôt. The machine shop or turnery adjoins the erecting shop along the north side. This is equipped with machine tools of different kinds, including planing, slotting and drilling machines, with other appliances. Power is supplied by a 36 H.P. steam engine. In present circumstances parts are received from Doncaster in the rough and the necessary machining is done in the machine shop at New England. The smith's shop is equipped with several smith's hearths and also a steam hammer, whilst other appliances comprise a shearing and punching machine, and a nut and bolt making machine. The paint shop, which contains three roads, is located alongside the east running shed at the north end.

Engines are lifted by hydraulic lifts when it is desired to drop the wheels, the smaller



GREAT NORTHERN RAILWAY LOCOMOTIVE DEPARTMENT, PETERBOROUGH.
Mr. Herbert Sinclair, the District Locomotive Superintendent (on the extreme right) and his chief assistants.

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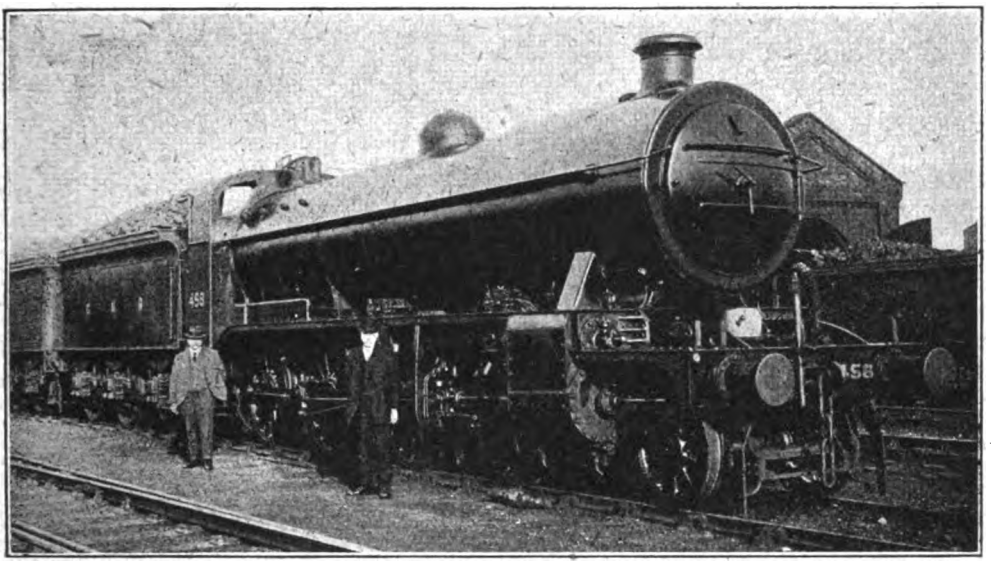
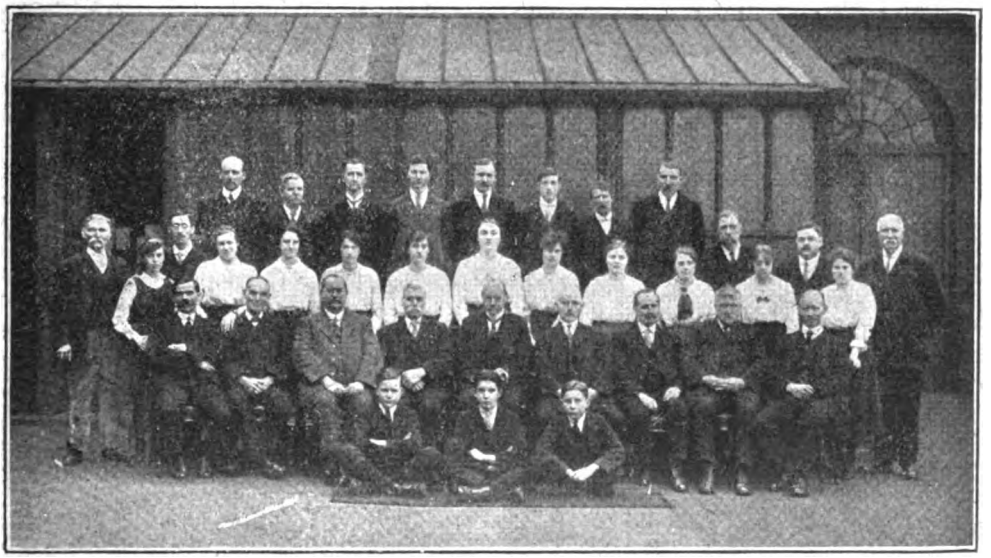


GREAT NORTHERN RAILWAY 2–8–0 COAL ENGINE, NO. 458.
In the six-foot way are Mr. Todd, Chief Clerk (near cab), and Mr. Fields, Chief Locomotive Inspector, Locomotive Department, New England.

locomotives being raised by means of hand cranes. The offices of Mr. Sinclair and his staff are arranged alongside the turnery as shown in the plan.

The number of employees at New England locomotive depôt, including the locomotive, carriage and wagon departments, is, in normal times, 1,160. These include 189 drivers and 183 firemen.

Mr. Sinclair is assisted by Mr. S. Todd as Chief Clerk and Mr. J. Fields as Chief Locomotive Inspector, who at present is acting as



GREAT NORTHERN RAILWAY LOCOMOTIVE DEPARTMENT, NEW ENGLAND.
Mr. Sinclair, the District Locomotive Superintendent, and his locomotive and office staffs.

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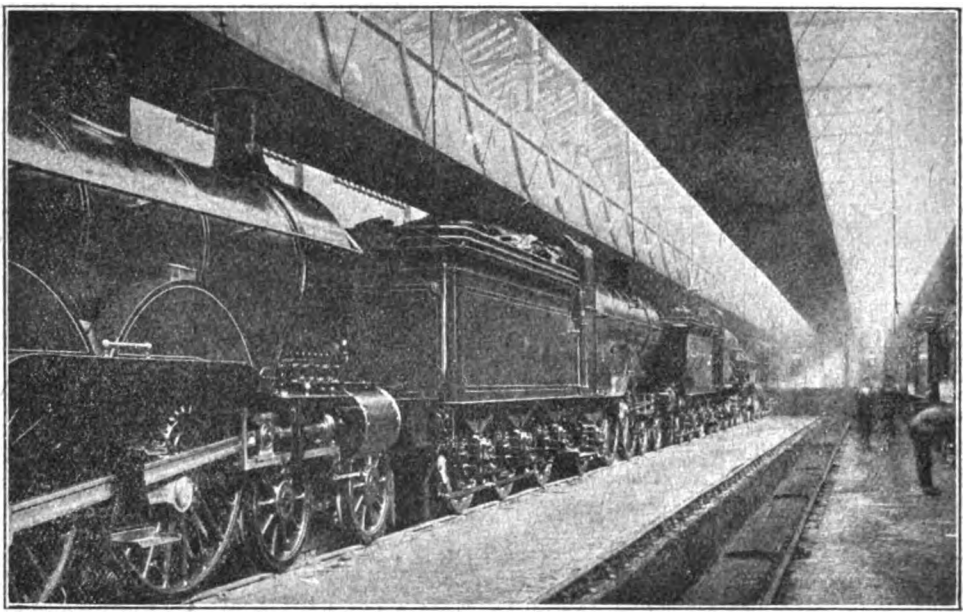

VIEW INSIDE 4-4-2 TYPE LOCOMOTIVE SHED, NEW ENGLAND.

Mr. Sinclair's assistant. The assistant Locomotive Superintendents, Messrs. S. Gearing and D. C. Stuart, are at present both serving with the forces as Second Lieutenants.

No turntable is provided at New England, the locomotives being reversed by means of the triangular track lay-out, the arrangement of which can be seen on the drawing. Engines coming off their trains at Peterborough station can by this arrangement be turned ready for their next trip and put in line for the coaling stage. They proceed from Peterborough northward, and arriving at New England yard pass over the curve marked "Angle Road" on the plan to the buffer stops and afterwards move forward again in the direction of the ash-pit and coaling stage. Other engines, of course, proceed direct to the sheds. The engines after being coaled pass either through the running shed or between them at the south junction on the way to Peterborough station.

The atmosphere in the New England depôt is one of considerable activity. Engines of all types are constantly moving about the yards, some coming and others going out for their day's work, whilst the main lines which run past the depôt and the extensive yards adjoining it are, even in these days, busy with traffic of all kinds.

The writer's thanks are due to Mr. H. N. Gresley, Chief Locomotive Engineer, Great Northern Railway, for permission to visit New England, and to Mr. H. Sinclair, the District Locomotive Superintendent, for the most generous facilities and assistance in getting together the necessary information for the compilation of the foregoing article.

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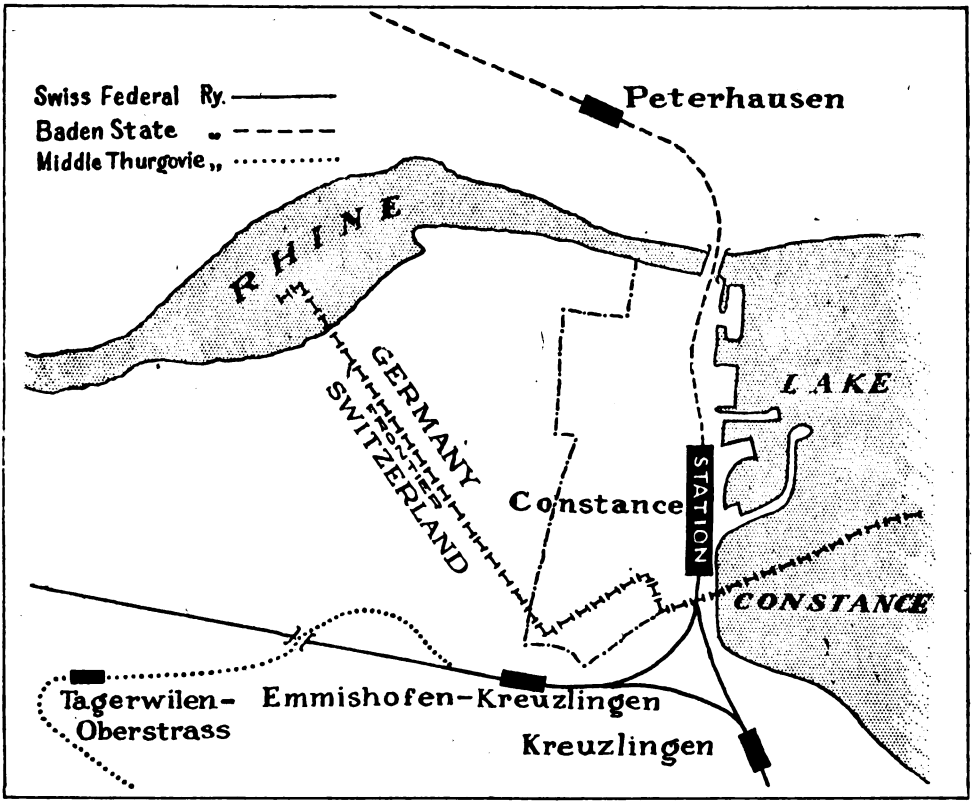
Constance: A Point of Exchange for Prisoners of War.

By EDWIN J. MILLER.

IN view of the added reputation the little country of Switzerland has acquired through the World War in its rehabitation of British prisoners of war at its health resorts some description of Constance, the point of exchange may be of interest to readers of the RAILWAY MAGAZINE.

Its situation is peculiar in that abutting directly upon the Swiss frontier, as will be seen in the map on this page, part of its growth has through recent expansion taken place on Swiss soil and the Swiss and German custom houses may be seen almost within the precincts of the town proper.

Historically and scenically the town only



THE FRONTIER POINT.

Constance (Konstanz) is a German town on the lake of the same name, situated at the north-western end of the lake at the efflux of the Rhine. Its population is about 29,000, and it was a free town of the Holy Roman Empire down to 1548 and after many vicissitudes is now part of the Duchy of Baden.

claims the attention of a very few travellers to Switzerland, owing to the greater attractions of the snowclad Alps and the lakes of central Switzerland. Nevertheless the quiet charm of the lake with its well peopled banks and surrounding green hills, with the chain of the Appenzell Alps in the distance is a pleasing scene. The town itself is of note as

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the residence and place of martyrdom of the Reformer Huss, A.D. 1414, and of the Conclave of Cardinals at the time of the Great Council 1414–1418, while it is one of the most ancient towns of Germany and retains many of its quaint mediæval characteristics.

The Hall of the Great Council, with its pointed roof, will be seen in the background of the view of the interior of the station on this page.

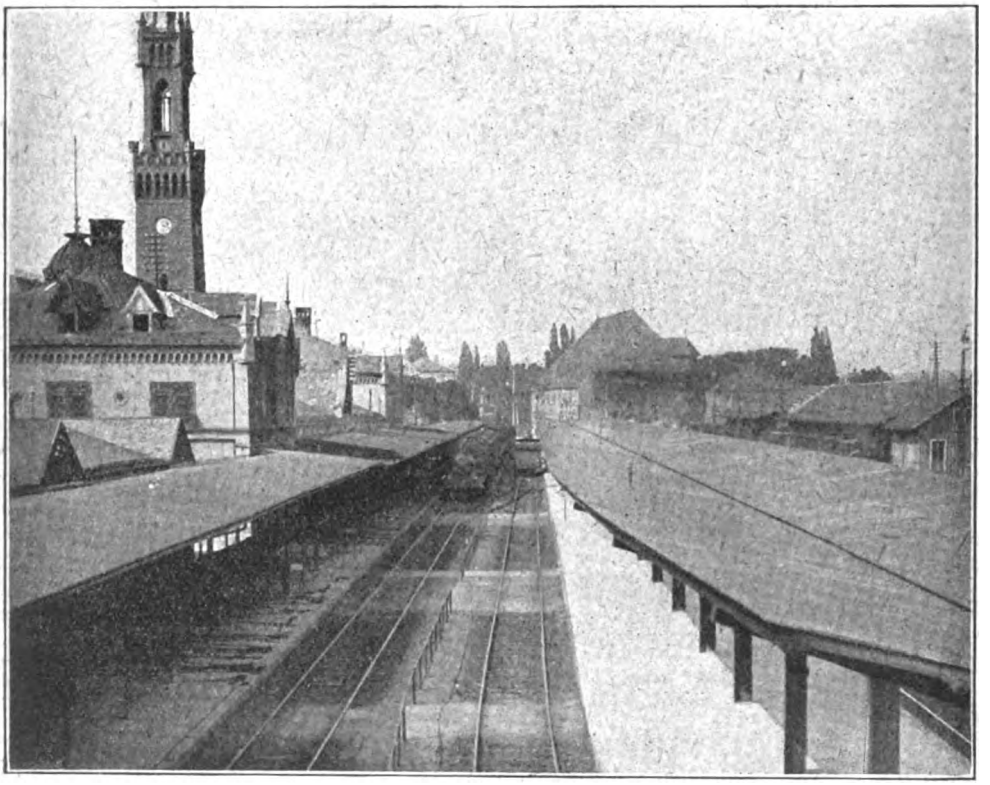
The map shows the four avenues of traffic running into the station of Constance. From the north is the Baden State Railway communicating with all parts of Germany. From the south three lines run in, two of which are the property of the Swiss Federal Railways run east and west to the interior of the country. The fourth line, of private ownership, the Middle-Thurgovie Railway (built with and by German capital) has only recently been opened and runs over the hills skirting the town to Wil, connecting *en route* with several of the State Railway lines.

It has shortened the distances by several miles and a large through goods traffic—especially in coal and allied products has been developed.

The station has three long platforms, one of which is of "island" type, and two trains often run to and from the same platform as conditions warrant.

The station building, as will be seen in the photograph is of architectural pretence, being for the use of the Baden State lines, while the two Swiss railways are relegated to the galvanised iron building alongside. Owing to the situation of the station and the growth of traffic the sidings at the south end of the station are situated in both the territories of Germany and Switzerland—the frontier line passing at the point of junction of the Swiss east and west routes.

To obviate this abnormal condition of affairs the Baden State Railways made a proposal in 1911 that the entire engine and shunting yards, also the Swiss Customs House, be transferred to Peterhausen and a



INTERIOR OF CONSTANCE STATION.

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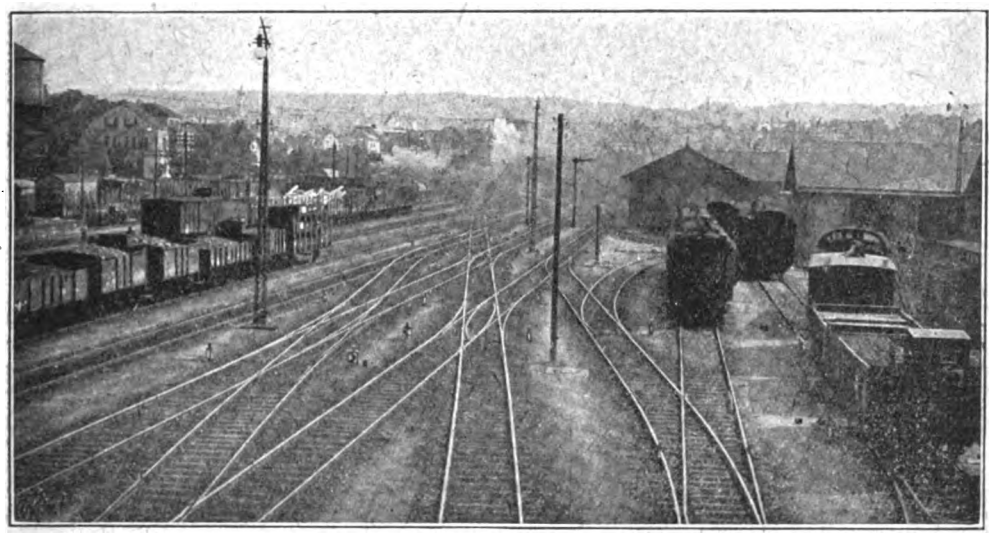
large yard be erected there at a cost of £500,000.

After careful deliberation the Swiss Federal Railways declined to agree with the proposal to transfer the yards, etc., entirely to German soil and requested a solution to be presented having for its basis a revised site on the left bank of the Rhine, *i.e.*, on or partly on Swiss territory. However, until the outbreak of war the matter remained in abeyance and it may be said that to all appearances the yards seem quite capable of dealing with the traffic received, except for certain formalities due to the nature of the site.

As a point of exchange both for goods and passenger traffic the station is an important



RAILWAY YARDS AT CONSTANCE.

one, and mention has already been made of the new traffic created by the newly opened Middle-Thurgovie line, which includes a large beer traffic from the Bavarian breweries.

It forms the point of departure and of arrival of a large number of through carriages with all important German towns, for instance Berlin being reached in about 16¾ hours. The majority of the train services run *viâ* the Black Forest line and are independent of the Swiss trains, except for certain direct services with through carriages to and from Swiss points.

From Constance to Bale there are two routes, each 90 miles, one *viâ* the Baden State Railways on the north bank of the Rhine and the other *viâ* the south bank, the Swiss Federal. These two have some pretence to a competitive nature and both pass through the town of Schaffhausen. It is of interest to note that the German route enters and leaves Swiss territory to reach Schaffhausen customs formalities being revised for through going passenger and goods traffic.

The operation of the Swiss through trains *viâ* Constance station presents points of interest in the working of the "triangle." On the journey east-west the Swiss Federal trains usually call at Emmishofen-Kreuzlingen, run direct to Kreuzlingen and call there, then back into Constance and again call at Kreuzlingen, *en route* to their destination. In the reverse direction the majority of the trains reach Constance after calling at Kreuzlingen and then proceed direct *viâ* Emmishofen-Kreuzlingen to their destination. The working of the "triangle" is of interest because there are a number of exceptions to the general procedure above outlined, several of the trains calling at both Swiss stations before and after entering Constance station.

Only the goods trains run without variation over the "direct" curve.

From official details the number of trains dealt with at Constance station during the summer of 1913 was 87 passenger and 19 goods. The Baden State Railway contributed a total of 50 and the Swiss lines of 56 (Swiss Federal 42 and Middle-Thurgovie 14).

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A certain amount of transhipment traffic with towns on the Lake is dealt with at the harbour, which is connected with the railway.

A few cars are taken direct on to special barges and a passenger steamer tows the barge across the lake. The size of the lake (40 miles long and 8 broad) and its situation make it liable to sudden storms, and sickness often occurs to the voyagers, while several barges have been turned over and the wagons thereon lost in the lake which is in parts 800 ft. and over in depth.

One of the reasons of the transport of cars by water is to avoid the necessity of passing through Austrian territory, a narrow strip of which separates Germany and Switzerland at the south-west end of the lake, and the customs delays thus imposed on through traffic. Great animosity is felt by the Swiss traders in the delays which thus occur and so the Swiss Federal Railways have also a wagon ferry but this is outside the scope of this article.

Owing to the fact that Swiss trains in their passage to and from east and north-east Switzerland have occasion at Constance to use a piece of German soil in order to reach the station, a convention has been made by which through passengers and baggage are exempt from customs inspection whilst on German territory, and in return Switzerland accords similar facilities at the station of Schaffhausen for arriving and departing trains.

For goods trains different arrangements are in force and at Constance the Swiss through trains do not enter the station but pass over the direct line of the "triangle."

The convention referred to carries with it the rights and privileges of Swiss Sovereignty over its nationals and subjects of other powers travelling in its trains whilst on German soil (and *vice versa* at Schaffhausen), so it is possible at the present time for subjects of Allied countries to remain in the Swiss trains during their journeys to and from and their sojourn at the German station of Constance.

Confirming this is the incident reported recently of two Englishmen who, unwisely alighting from their train at the station, were arrested and interned, whereas they would have been immune had they remained in the train.

A few explanations of the photographs will be of interest. In the photograph of the yards will be seen the two signals protecting the main departure and arrival lines; the frontier is just beyond this point and at the rear of the engine shed—the foreground Germany and the Swiss hills bounding the lake in the distance. The interior of the station shows a German train arrived from Bale, over the Rhine bridge, which is about 200 yards beyond the Hall of the Great Council already referred to.

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

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Stamping Parcels for Railway Transit.

By J. H. JACKSON.

STAMPS and Railways! It is not easy for the mind to make the association. It has been trained to connect stamps with post office work, but not with railways, whose system of accounts has always appeared to be something weird and wonderful. Yet, from October 1st, 1917, all the railways in the United Kingdom (with the exception of one or two very small undertakings) and the many steamship lines working between Great Britain and Ireland, have adopted, as a war measure, face value stamps for their merchandise traffic conveyed by other than goods trains. The stamps used have an interchange value, and thus the stamps of one company will frank a parcel over its own or any " controlled " line in the United Kingdom, as completely as a post office stamp franks a parcel or a letter for which it undertakes responsibility. Each railway has its own sets of stamps, and, consequently, there are varying sizes, shapes and colours, but they all have the common characteristic of interchangeability and all possess a fixed face value. This general adoption of the stamp system, made possible by war conditions, has effected a simplicity in parcel working, so desirable and necessary in the present state of labour shortage, and is a splendid illustration of the complete and effective manner in which railway traffic accounting can beneficially adjust itself in special circumstances of stress.

Let us briefly trace through the methods of accounting for parcel traffic (by that I mean all merchandise traffic by passenger trains, including live stock) from the time when no stamps at all were used, up to the present, when the stamp system has secured universal acceptation.

Parcels, like all other railway traffic, may be divided into two great classes, local and foreign—the former being traffic confined entirely to the line of the one company, and the latter representing that passing over two or more systems. In the case of " local," a railway can please itself as to what measures it shall adopt for recording and checking purposes, but for " foreign " there must be mutual satisfaction with regard to the methods of accounting, and a more or less common system for the purposes of dissecting and apportioning the charges between the companies concerned. Three principal factors have in fact to be considered, viz. :—

(1) Identity of the charges with the traffic.

(2) A ready means for an independent record of foreign traffic by the stations of the terminal companies concerned.

(3) An easy and effective medium for checking a station's accounts.

The waybill system adequately fulfilled these requirements, and, consequently, was adopted for both local and foreign traffic, thus securing an uniform method. It provided a document containing the necessary particulars for identification with the traffic carried, and made possible the satisfactory carrying out of conditions (2) and (3) by forming a basis from which both the forwarding and receiving stations could abstract the daily weights or numbers and money, summarise them at the end of the month, and transmit both abstracts and summaries to headquarters or the Railway Clearing Houses for comparative checking purposes. The essence of the system was separate returns from both ends, and an adjustment of differences from an independent centre. It was comparatively simple, it was effective, and although in course of time a different general system might have been evolved, even without the intervention of war conditions, it must have been based upon data such as the waybill system alone could readily provide. But the war is a fact, and the assumption of the control of the railways by the Government rendered unnecessary any settlement of traffic receipts between the various railways affected. This had the effect of giving to foreign traffic all the main characteristics of local, so far as accounts were concerned, and the companies were thus able to re-consider their methods, apart from any question of division, and from the point of view, mainly, of record and check.

As already remarked, local traffic could always be dealt with according to the wishes of the particular railway, and, although

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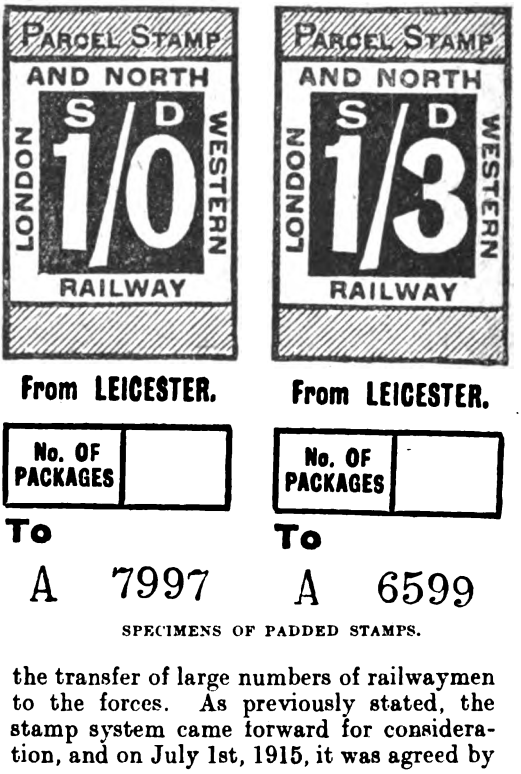
originally the waybill system was uniformly used, some of the companies had, prior to the war, introduced a stamp system for their local "parcel" traffic, *i.e.*, traffic under

SPECIMENS OF SHEET STAMPS.

2 cwts. in weight, so called to distinguish it from the heavier traffic, technically known as "miscellaneous." The stamps had a definite face value and were affixed to a parcel in a similar manner to a post office stamp, except that the railway employees did the affixing, and not the public. The waybill was abolished for the traffic brought under the arrangement, as it was no longer necessary for identification purposes, and the accounts of the transactions were all concentrated at the forwarding point. The independent returns from both forwarding and receiving stations were, of course, no longer available, and special checks had to be substituted to safeguard the revenue. At that time traffic was not all prepaid, a considerable portion was sent "to pay," and for this a special label was set up which was placed on the parcel by the forwarding station, and upon which the weight and to pay charges were shown. The charges were collected by the receiving station, who accounted for them in a similar manner to that adopted for stamped paid traffic. Now, as everyone knows, there is practically no "to pay" parcel traffic, so the label in question ceases to have any great interest for current purposes. The new system was found to be very simple in character and labour saving in its operation. It had, indeed, very much of the simplicity of the ordinary over-the-counter transaction and was found, in practice, to be admirably adapted to the class of traffic for which it was brought into use. When war broke out, therefore, it was not surprising that the railways, faced with the necessity for economies in labour and other matters, and with the problem of "foreign" adjustments removed, should turn to a system which had already proved itself satisfactory by a fairly extensive trial, and stood out as an alternative which could not be overlooked.

Although the Great Eastern Railway introduced a face-value stamp as long ago as 1880, its general use was discontinued the following year, and to the London and North Western Railway really belongs the honour of being the pioneer stamping company. In fact it is their system, with particularly few modifications, and these only in detail as dictated by experience, which has been adopted by all the companies in the United Kingdom. The London and North Western Railway introduced the stamp system for their local "parcel" traffic in May, 1898, and when war broke out it was still in force, and had justified itself by more than 16 years of actual working. During that period some of the other railways had adopted stamps for similar traffic, but there remained many who still adhered entirely to the waybill system.

The war, however, altered conditions, and there was an imperative need for re-adjustments to meet the position created by



SPECIMENS OF PADDED STAMPS.

the transfer of large numbers of railwaymen to the forces. As previously stated, the stamp system came forward for consideration, and on July 1st, 1915, it was agreed by

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all the "controlled" railways in Great Britain to adopt, for the period of the war, stamps and "to pay" labels for their "parcel" traffic, and, in addition to recognise each other's stamps and labels in the same way as their own. "Miscellaneous" traffic was still to be waybilled, as was also traffic (parcel and miscellaneous) with Irish Railways, which were not then "controlled." In spite of these exceptions, however, the principle of interchange availability had been set up, and a long step forward had been taken towards establishing the parcel stamp as the recognised franking medium for passenger train merchandise.

On April 2nd, 1917, the decision to make all parcel and miscellaneous traffic prepaid, and not so naturally adapted for stamping. But as the Government control had done away with one of the chief dangers from a faulty separation of the two classes, the difficulties remaining could not be looked upon as insuperable, in view of the advantages to be gained from an uniform method. Special means were devised to meet special cases and with certain modifications in detail only, it was agreed to extend the stamping arrangements to miscellaneous traffic with all the "controlled" companies in Great Britain. This extension came into operation concurrently with the prepayment arrangements, *i.e.*, on April 2nd, 1917.

Ireland still remained outside the system. There were several reasons why the Irish

PARCELS ARRIVING TO BE STAMPED.

was put into effect, and certain accounts arrangements became necessary in order to meet the new position. This led to a consideration of the applicability of the stamp system to miscellaneous traffic. Apart from the fact that, before the war, it had been very important to make a clean cut as between parcel and miscellaneous traffic, for special settlement purposes, the varied character of the "miscellaneous" had rather tended towards retaining it under the waybill system. Coming under that head are live stock, traffic in truck loads, milk, etc., which, as will easily be seen, are of an entirely different nature to the lighter and more uniform traffics, designated "parcel," railways should have been less anxious than the lines in Great Britain to make a change. For example, when the stamp was given an interchanged availability the Irish were not "controlled," and, consequently divisions of their "through" traffic were still required. There had been no experience amongst them of parcel stamping, the whole of their traffic being dealt with under the waybilling system. They, also, had not felt the effects of the war in a shortage of labour, to the same extent as the English, Scottish and Welsh systems. But the control of the Irish railways, assumed by the Government on January 1st, 1917, forced the question to the fore, and brought it within the realms

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of practicability. It was not easy of settlement, as there were many steamship lines running between Great Britain and Ireland not under control, and for which special arrangements had to be made, but the difficulties were gradually overcome, with the result that, on and from October 1st, 1917, the Irish lines have, for the period of the control, adopted the system for their own local and interchanged traffic, as well as for that with Great Britain.

The stamp system is now undergoing a test in a full and complete manner, in particularly favourable circumstances. While a satisfactory result will not conclusively prove its suitability, should pre-war conditions again prevail, it will, I think, make inevitable an effort to secure its continuance, whatever the future requirements may be. One cannot easily imagine a return to the old times when waybills had to be compiled, abstracted and summarised at both the originating and terminating points, except under pressure of difficulties too great to be resisted advantageously by a method carrying with it the tremendous weight of simplicity and directness. There is, however, very little purpose in speculating on the details of future accounting, when the future of the whole railway world seems to provide ground for an almost general prophecy and speculation.

A complete change, such as the general adoption of the stamp system constitutes, in matters concerning the accounts of thousands of separate depôts, wide-spread and varying in their characters, is no small thing. Where every step has to be taken with a primary regard to safety, movement, generally, has to be slow, but no one can say that there has been any lagging in the development of the stamping method to meet war conditions. It is a striking tribute to the original inceptors of the system, that an absolutely isolated experiment, limited in its application, should have so justified itself as to receive universal acceptance at a time when the very existence of the Nation demands, from every quarter, maximum effectiveness with the shortest and least complicated methods.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—
L. & N.W.: Jan., Feb., March, May, 1915.
Great Northern: June, July, 1915.
M.S. & L.: Aug., Sept., Oct., 1915.
Great Western: Nov., Dec., 1915; Jan., Feb., March, April, May, June, July, Aug., 1916.
Glasgow & S.W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916; Jan., Feb., March, April, May, 1917.
South Eastern: June, July, August, 1917.
Lancashire and Yorkshire Railway: Sept., Oct. and Nov., 1917.

In February, 1918, Mr. Ahrons will continue to deal with The London, Chatham and Dover Railway.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.

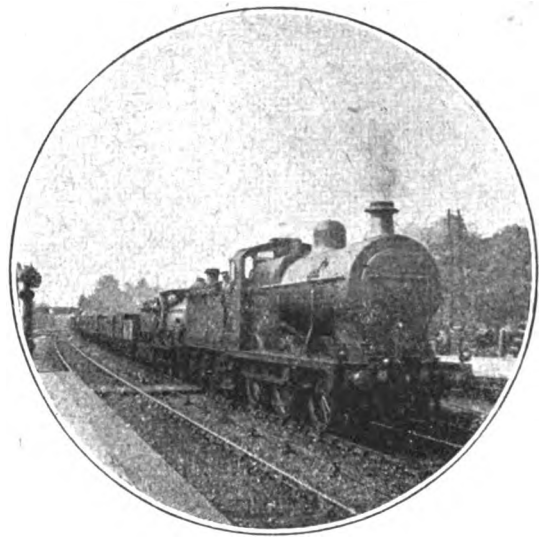

Photo [*F. H. Stingemore*.

MIDLAND RAILWAY.

Double-headed up goods train hauled by superheater 0–6–0 engine, No. 3838, piloting, and old Kirtley outside framed 0–6–0 engine, No. 2597.

IT cannot be said that 1917 has been a great year in respect of locomotive developments, but in view of the continuance of war conditions that is hardly a matter for surprise. Nevertheless some novel and interesting types have come into being. In chronological order of construction we have first the two exceedingly handsome superheater 4–4–0 engines designed by Mr. C. Cumming for the Highland Railway, and named *Snaigow* and *Durn* respectively. With 6 ft. 3 in. wheels and 20 in. by 26 in. cylinders they should be capable of excellent work on the "Furthest North" section of the Highland line, with its heavy switchback grades, which is principally their field of service. One of their unusual features is embodied in the reversion to outside cylinders, this being the first instance of outside cylinder propulsion in a new 4–4–0 type, I venture to think, since the "County" class of the Great Western Railway. These two engines really belong to 1916, although their details were not made public until early in the present year. In a similar category is the large 0–6–4 express tank, No. 114, of the North Staffordshire Railway, designed by the late Mr. J. H. Adams, also with 20 in. by 26 in. cylinders, and with driving wheels 5 ft. 6 in. in diameter. Feed water heating, in addition to a superheater of the Robinson pattern, are provided in this fine locomotive, which weighs in working order 74·1 tons.

Next in the list come the further evidences of Mr. Pickersgill's activity on the Caledonian Railway, in the shape of new 4–6–0 express passenger and 4–6–2 tank locomotives. These follow the lines generally of his successful 4–4–0 experiment of 1916, but are of particular interest in that they break with the inside cylinder practice that has been traditional on the "Caley" since the days of Connor. The small cylinder dimensions that characterised Mr. McIntosh's designs are even more pronounced in these locomotives, the 4–6–0 express engines having cylinders only 20 in. diameter by 26 in. stroke. With the area furnished by the Robinson superheater, the total heating surface is 1,934 sq. ft., but the grate is comparatively small, as its area is 25·5 sq. ft.; working pressure is 170 lbs. per sq. in. These are heavy engines, their total weight in working order being 75 tons (of which 56½ tons are adhesive), or with tender holding 7 tons of coal and 4,200 gallons of water, 121½ tons. So are the 4–6–2 tanks, weighing as they do 91¾ tons, of which 55 tons are available for adhesion. The latter have 5 ft. 9 in. driving wheels and 19½ in. by 26 in. cylinders; working pressure is again 170 lbs., but the heating surface totals 1,736 sq. ft., and the fire-grate has an area of 21½ sq. ft. Twelve of the latter engines have been built by the North British locomotive company, and are engaged on various duties, from those of "pusher" on Beattock bank to goods traffic

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round Glasgow, and express passenger traffic on the Clyde coast trains. Of the 4–6–0 express engines six have been turned out from St. Rollox Works to the present date.

Two other locomotive "surprises" of the year have been Mr. Maunsell's 2–6–0 express goods and 2–6–4 tank engines on the South Eastern and Chatham Railway. A letter was recently quoted among the correspondence paragraphs of the RAILWAY MAGAZINE in which the writer claimed Great Western influence because the boiler of a certain new locomotive was to be slightly coned, and the curves at the leading and trailing ends of the running plate, the raised tender and sloping downward on top towards the cab. Further, also, than that, the steam is collected by means of a perforated cros pipe situated in the front top corner of the firebox—another Great Western Railway speciality—the dome merely housing the top-feed arrangement. Thus, after a lon interval, the South Eastern and Chatham Railway returns to what is virtually a domeless boiler—so far as the collection of steam is concerned—which it last knew in the days of Stirling.

Another Swindon feature in each engine is the length of stroke in relation to the diameter of the cylinders, which, while not so extreme as the 30 in. to 18 in. of many

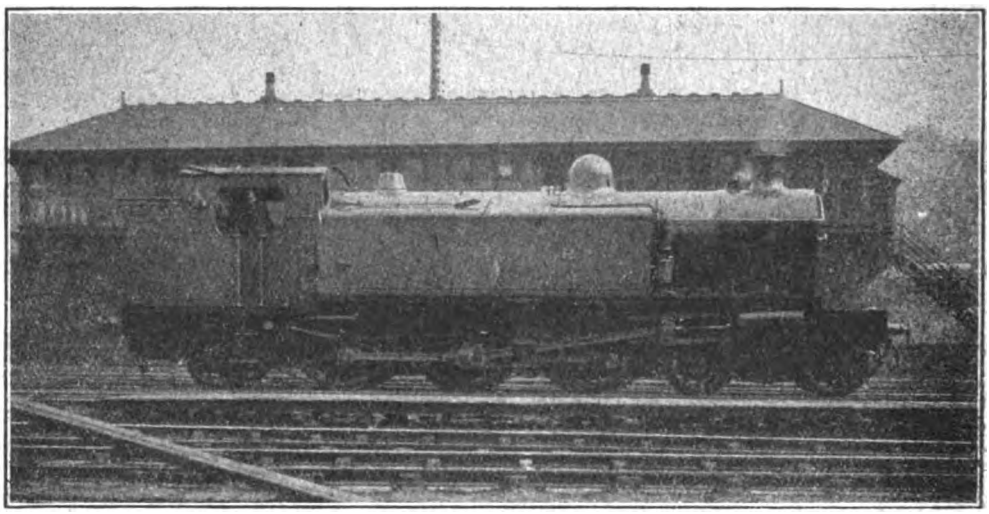

Photo [*Captain R. A. Chrystal.*

CALEDONIAN RAILWAY.

Pickersgill superheater 4–6–2 tank locomotive, No. 945, at Edinburgh.

side sheets and the shape of the cab showed some similarity to current Great Western Railway practice. Now all these, except perhaps the first, are mere trivialities of resemblance, which obtain, in one or other particular, on other lines than the Great Western Railway also. But the most marked imitation of a real Swindon "speciality" that one has ever noted off the Great Western Railway is found in the design of the boiler and firebox of these new South Eastern and Chatham engines, which are identical in both classes. For this boiler has not only the pronounced coning that is so familiar in Great Western Railway designs, but the Belpaire firebox has the same peculiar shape, both tapering inwards at the sides

2-cylinder Great Western Railway engines, is nevertheless 28 in. to 19 in. The conjunction of outside Walschaert motion with a single slide-bar cross-head is quite an unusual characteristic, so far as this country is concerned. So far as boiler and cylinder dimensions go, both engines are identical. Total heating surface is 1,729 sq. ft., inclusive of superheater (a patented design of Messrs. Maunsell and Hutchinson); grate area is 25 sq. ft., and working pressure 200 lbs. per sq. in., the last-named high figure in conjunction with superheating again pointing to Swindon influence. Cylinders, as previously mentioned, are 19 in. diameter by 28 in. stroke in each case, but the tank engine has 6 ft. coupled wheels, whereas

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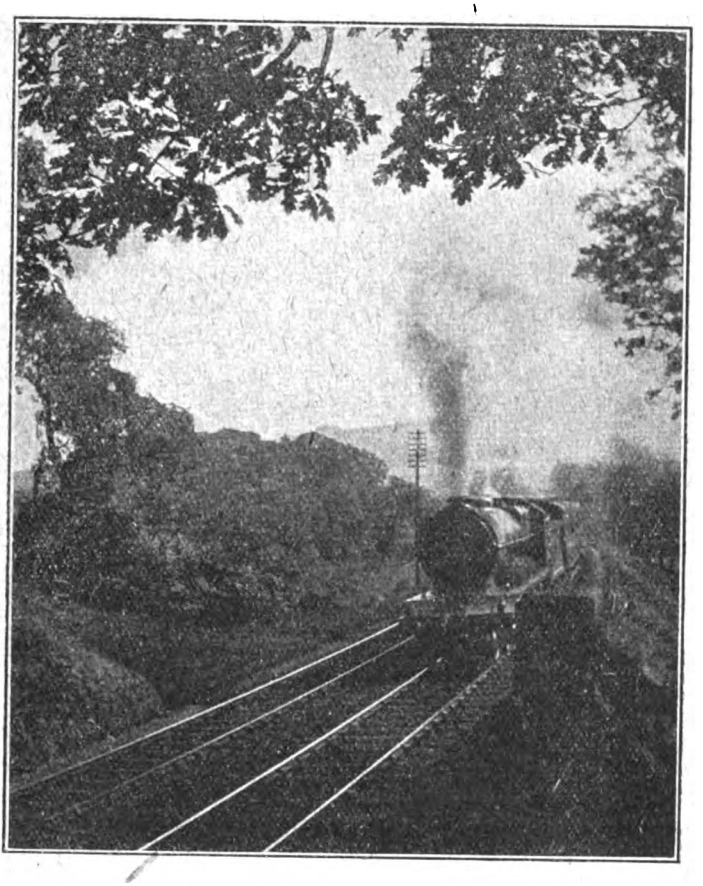
those of the goods engine are 5 ft. 6 in. diameter. Weight of the former in working order totals 82½ tons (52¾ tons being adhesive), whereas the "Mogul" weighs 59½ tons, of which 51 tons are available for adhesion. The tank engine for some time did good work on the 8.10 a.m. from Folkestone Junction to Cannon Street, one of whose intermediate bookings — Sandling Junction to Tonbridge, 35¾ miles in 41 min. 486 class, but will incorporate several altered features, such as a slightly coned boiler, 6 ft. 7 in. wheels (for fast passenger service), and very large cylinders, 22 in. diameter by 28 in. stroke. The last-mentioned dimensions are shared in this country only by the 4-6-4 tank engines of the London, Brighton and South Coast Railway. Another interesting, though minor, feature of the new London and South Western



Photo] [*W. F. Anderson.*

NORTH BRITISH RAILWAY.

Carlisle to Edinburgh express, headed by "Atlantic" locomotive, about to enter Buckholm tunnel near Galashiels.

—is the fastest at present operating on the South Eastern and Chatham system.

The final novelty, which may or may not be ready for service before the end of 1917, is found in the new 4–6–0 engines building at the time of writing for the London and South Western Railway, to the designs of Mr. R. W. Urie. These engines will be similar in design and general appearance to the engines is the reversion to the old "stovepipe" chimney of Mr. Adams' time, now equipped, however, with a *capuchon* of business-like appearance. Another series of these engines with 5 ft. 7 in. wheels, is also to be built to supplement the mixed traffic main line locomotive stock. Beyond these new types, there has not been much of locomotive importance to chronicle during 1917.

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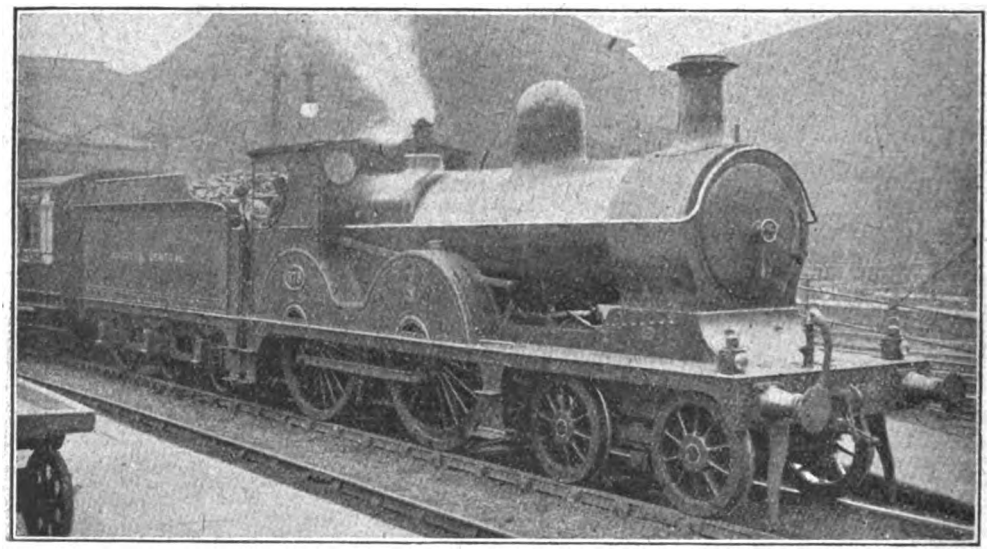
except the increase of the "Claughton" stud on the London and North Western Railway to 50 engines, with the prospect of a further expansion to a total of 60, the raising of the total of Great Eastern Railway 4–6–0 engines to 40, the building of further "Moguls" on the Great Western Railway and Great Northern Railway, and the increasingly rapid equipment of engines of almost all classes, on all the principal lines, with superheating apparatus.

Train services have seen but little in the way of alteration since the drastic revision of January, 1917. Despite circumstantial rumours at various times, no further curtailments worth mentioning have taken place on any line except the London and North Western, and these latter have been neither extensive nor serious. On that system the withdrawal of the 1.50 p.m. from Euston to Birmingham has led to the addition of a Birmingham portion to the already prodigious 1.15 p.m. "Scotsman" *ex*-Euston. In the up direction the 8 a.m. from Rugby to London has been cancelled, the 7.30 a.m. from Birmingham taking up its working as from Rugby southwards, with extra stops at Northampton, Wolverton, Bletchley and Leighton, arriving at 10.33 a.m. This train is now very smartly timed between stops, the 41¼ miles from Leighton to Willesden, for example, being only allowed 47 min., but in consideration of the heavy average weight of the train the allowances between Northampton and Leighton are too small, and time is not kept. The 8.15 a.m. from Carlisle to London omits all stops between Crewe and Bletchley, and also the Watford stop, but the arrival time in Euston is unaltered at 4.20 p.m. Further calls at Nuneaton and Bletchley, in addition to those previously arranged, make the present arrival time in London of the 5.20 p.m. *ex*-Liverpool 10.15 p.m., instead of the one-time 9.15 p.m. The 1.35 p.m. from Carlisle to Euston is combined with the Manchester express hitherto due at 8.35 p.m. (the Liverpool portion of the latter is withdrawn altogether), and with calls at Nuneaton and Rugby (the Bletchley stop being omitted) reaches Euston at 8.50 p.m. Other withdrawals are those of the 1.17 p.m. *ex*-Rugby and the 8.30 p.m. *ex*-Nuneaton, both semi-fast trains, to Euston.

Further slight all-round deceleration has taken place on the Midland Railway, as if that which took effect in January last were not sufficient. From October 1st several of the Sheffield and Leeds trains, including the day Scotch expresses, received extra allowances of 5 min. or so, while from November



Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY.

Pollitt 4–4–0 engine, No. 878. Rebuilt by Mr. J. G. Robinson.
At London Road station, Manchester (M.S.J. & A. Platform).

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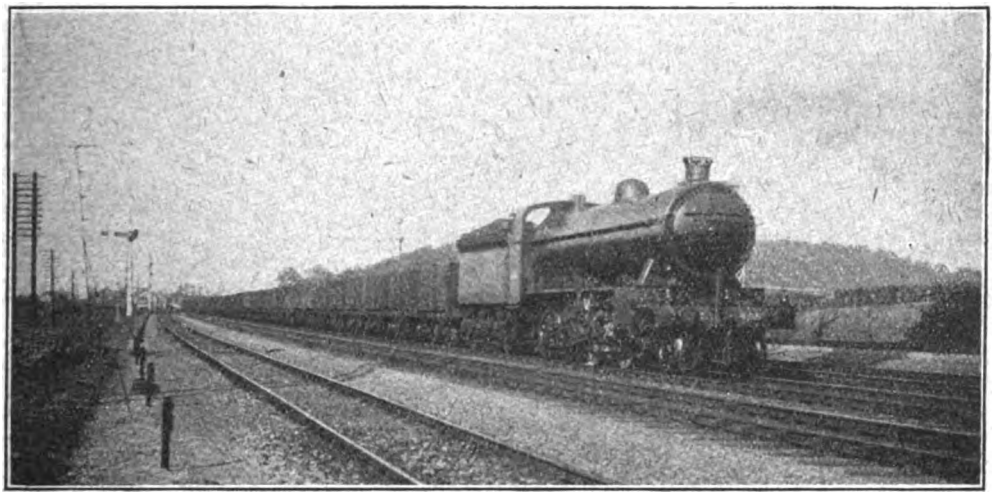
5th practically every one of the London–Manchester trains, up and down, was slackened uniformly by 10 min., making the average journey time by Midland from London to Manchester 5 hours 10 min., and from Manchester to London 5 hours 20 min. The other principal changes in October were the division of the very heavy 1 p.m. southbound express from Leeds as far as Chesterfield, the West of England portion leaving first at 12.45 p.m. and the London portion, at 1 p.m., making an extra stop at Cudworth. Connection also is now again made, as for many years past, by the 9.10 a.m. Scotch express *ex*-St. Pancras, to Sheffield, at Chesterfield.

Various other slight alterations have occurred on other lines. In August the averaging 56 m.p.h. On the London, Brighton and South Coast various changes have taken place, mostly for the better. The 11.40 a.m. from Victoria to Brighton is now run separately from the 11.50 a.m. *ex*-London Bridge, while the 8.10 a.m. up from Brighton is also duplicated; by the last-mentioned alteration the London, Brighton and South Coast Railway once more has a 50 m.p.h. booking, the second or London Bridge portion running from Brighton to Croydon, 40½ miles, in 48 min. On Sundays both the Brighton and the Eastbourne "Pullman Limiteds" have been reinstated, the former taking 65 min. and the latter 90 min. on the journey, while the Eastbourne train also conveys third class coaches. No



Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

2–8–0 superheater mineral engine, No. 456, on train of eighty 10-ton loaded coal wagons and a 20-ton brake. Total load about 1,300 tons behind the tender. Photographed about half-a-mile south of Sandy station.

Great Eastern Company put on a new express at 12.20 p.m. from Ipswich to Liverpool Street, relieving over that section of line the heavy "slow" from Norwich and Yarmouth due in Liverpool Street at 3.18 p.m., and providing quite a good mid-day service, with the fastest existing schedule from Colchester to London, *i.e.*, 66 min. The London and South Western Railway has now arranged for its 5.50 p.m. West of England "diner" *ex*-Waterloo to call at most stations beyond Salisbury, and no longer to run beyond Exeter: the final booking of this train is a remarkably smart one of 18 min. for the 16·8 miles from Honiton into Exeter (mostly downhill) other train service changes of special note have taken place during 1917.

The great feature of the past year, of course, so far as locomotive performance on express trains is concerned, has been the vast loading of unpiloted trains. As an illustration, and not an exceptional one by any means, I might record the result of some observations on a mid-day stroll round some of the Northern termini during the month of July. At Euston the 11.50 a.m. to Birmingham and Liverpool was made up to sixteen "eights," weighing empty 432 tons, and the 1.15 p.m. (this was before the addition of the Birmingham portion) to five 12-wheelers and eight 8-wheelers, or 442

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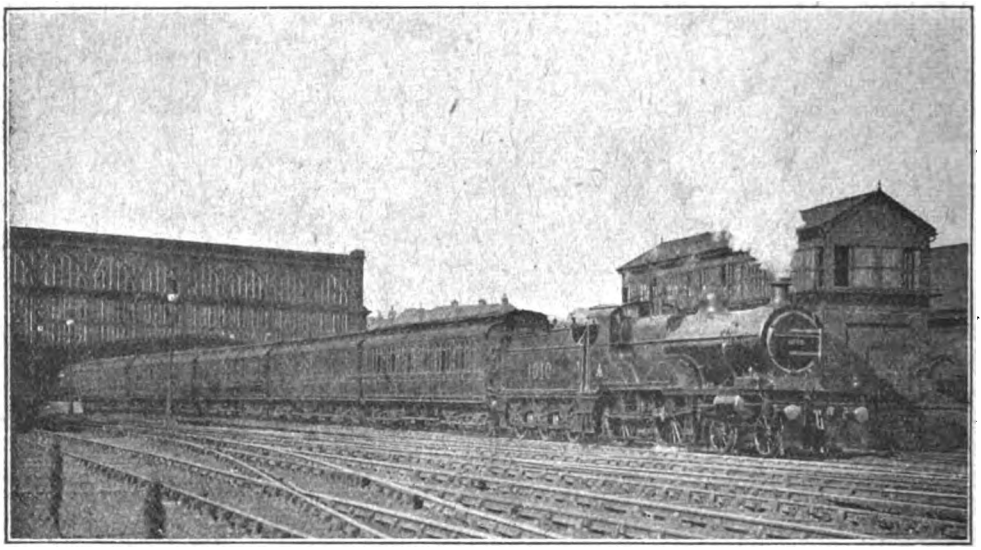
tons empty. At King's Cross the 1.30 p.m. to York and Leeds boasted sixteen 8-wheelers of the latest stock, or no less than 464 tons tare, while the 2 p.m. Scotch express was working in empty with 13 "eights" and a "twelve," or 414 tons, which were probably added to with "extras" before the time of departure. This was an average day in mid-week. On other occasions I have seen the 5.30 p.m. *ex*-King's Cross made up to seventeen 8-wheeled corridors, the 5.10 p.m. arrival from Newcastle with 18 bogies on, while I have reliable information to the effect that one of the up night "Scotsmen" has startled King's Cross with a total of nineteen vehicles. Loads exceeding 60 axles have, indeed, been quite commonplaces on the Northern lines. Even on the Great Eastern Railway, the 5.23 p.m. to Yarmouth, Lowestoft and Norwich has left Liverpool Street nightly for months on an unaltered schedule with sixteen bogies behind the tender, and yet has kept better time than almost any main line train on the system, despite this 425-ton tare load. Similar instances could be given on nearly every line, but I must without further ado hasten on to performance.

It has been my custom hitherto, in the first issue of the New Year, to describe the best runs that I have timed in the year just expired, but for two reasons it is difficult on the present occasion to adhere to previous standards. The first is that the continuance of war conditions has for the time being somewhat curtailed my travelling, and the second is, of course, that the character of present day schedules renders record-breaking a much more rare occurrence than hitherto, and the more so as making up lost time seems by no means to be encouraged in these days. For all that, I have enjoyed some interesting runs during the past year, and I may, perhaps, supplement these with some particularly fine trips that have been timed by friends during the same period.

Let me commence with an up journey on the Great Western Railway that had some quite exceptional features. The train concerned was the 10.15 a.m. from Exeter to London, running—as this was a Monday morning—*viâ* the short route, with intermediate stops at Taunton and Westbury, and due in Paddington at 1.45 p.m. A 4-cylinder 4–6–0—No. 4002, *Evening Star*—was at the head of the train, and the load from Exeter was one of nine 70-ft. 8-wheelers, very full indeed, weighing 297 tons empty, and 320 tons with passengers and luggage. The start was brisk, Stoke Canon, 3·5 miles, being passed in 6 min. 25 sec., and Hele, 8·4 miles, in 12 min. 10 sec., despite the continuously rising grades. Speed had risen to 55½ m.p.h. when we were very badly checked—



Photo] [*F. E. Mackay.*

MIDLAND RAILWAY.

Glasgow–St. Pancras express leaving Carlisle. 4–4–0 Deeley compound locomotive, No. 1010.

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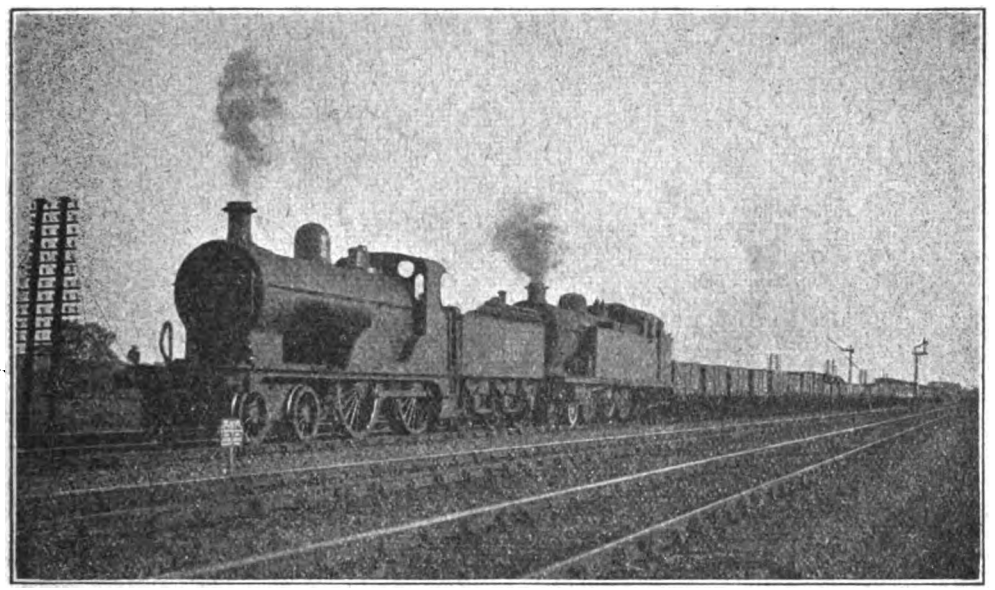
to 15 m.p.h.—for underline bridge repairs. Nevertheless we recovered to 43 m.p.h. at Collumpton, went up the 1 in 154 beyond at a steady 40, accelerated to 52 on the easy mile past Tiverton Junction, and then breasted the 1 in 115 to Whiteball at a sustained 39½ m.p.h., in each case an excellent achievement. So Tiverton Junction, 14·9 miles, was passed in 22 min. 25 sec., and Whiteball, 19·9 miles, in 28 min. 55 sec., or 26 min. net. Down Wellington bank we touched 82 m.p.h., then slacked, and afterwards maintained 79 for some distance, covering the 8·9 miles from Whiteball to Norton Fitzwarren in 7 min. 40 sec.; a slight signal check outside Taunton made the total time from Exeter, 30·8 miles, 39 min. 20 sec., but the net time was 36 min., or a minute under schedule.

Our re-start from Taunton, after the addition of three more 8-wheelers, was a brilliant one. The tare load was now 368 tons, and the gross load fully 400 tons, but for all that we were through Cogload Junction, 5 miles, in 7 min. 35 sec.; Curry Rivell Junction, 11·9 miles, in 14 min. 35 sec.; Somerton, 17·2 miles, in 19 min. 55 sec.; Keinton Mandeville, 22·7 miles, in 25¼ min.; and Castle Cary, 27·6 miles, in 29 min. 40 sec.—really first-class times throughout. Slacking to 50 m.p.h. at Cogload, we were doing a sustained 67 at Curry Rivell, and then, going up the 1 in 264 to Somerton at a minimum rate of 55 m.p.h., touched 69 on the corresponding descent to Keinton, while the rate had not fallen below 62½ m.p.h. at Castle Cary. But at Bruton, most unfortunately, we were stopped dead on account of an up "goods" making a tardy shunt at Witham. For this reason, and on account also of an unduly long and exaggerated slack through Frome, and a slow recovery thereafter, the 19·7 miles from Castle Cary to Westbury occupied 30 min. 40 sec.; making the total time for the 47·3 miles from Taunton 20 sec. over the hour. Unchecked, we could without difficulty have completed this section in 54 min.

From Westbury start, again, notable work was performed. On the gradually ascending grades past Edington we reached 57½ m.p.h., and took the 5¾ miles of Lavington bank (practically all 1 in 222) with nothing lower than 45 m.p.h. The 9 miles of undulations beyond Patney, mostly on ascending grades, produced a maximum rate of 62½ m.p.h., and then we went up the 1¾ miles at



Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Down goods train between Bedford and Oakley.
Pilot 4–4–0, No. 430; train engine, 4–6–4 superheater tank, No. 2105 (late of L.T. & S. section).
These locomotives work between Wellingborough and Cricklewood, the tank engine being piloted in all cases.

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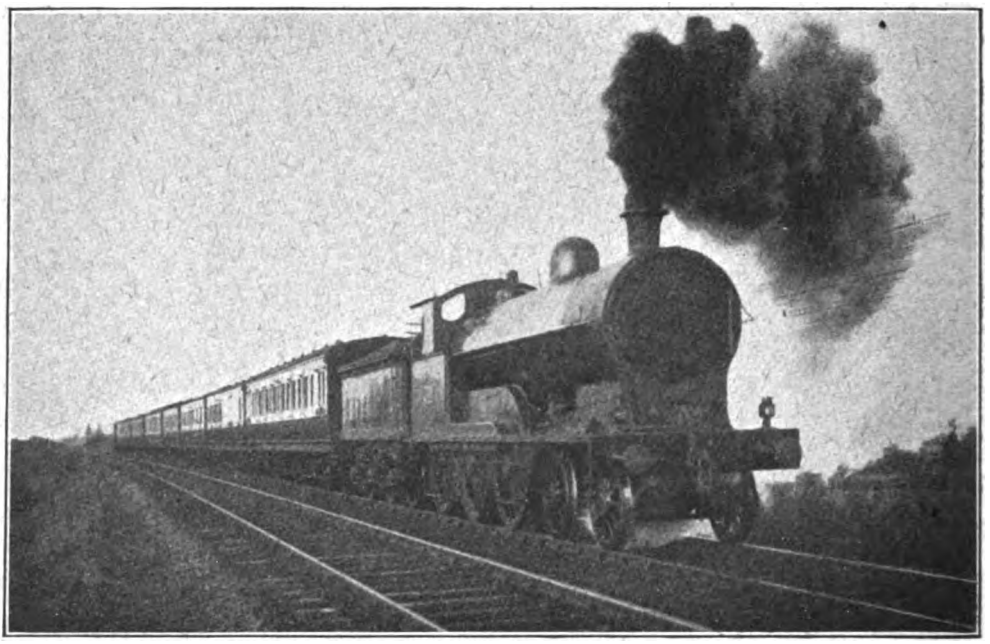
1 in 240 and ¾ at 1 in 153 to Savernake at a minimum of 57½ m.p.h. This magnificent hill-climbing furnished the following times: from Westbury to Lavington, 8·7 miles, 12¼ min.; to Patney, 14·5 miles, 19 min. 25 sec.; to Pewsey, 20·3 miles, 25¾ min.; and to Savernake, 25·5 miles, 31 min. 5 sec. But then once again came an exasperating string of severe signal checks right the way from Wolfhall Junction down to Hungerford, so that the 17 miles from Savernake to Newbury consumed no less than 25¼ min. In view of the small number of passenger trains now using this route, one might have to 67 at Slough and 64 at West Drayton. The 5 miles from Reading to Twyford took 6 min.; the 12·5 miles thence to Slough, 11½ min.; the 9·4 miles on to Southall, 8 min. 40 sec.; the 7·8 miles from Southall to Westbourne Park, 7 min. 50 sec.; and the last 1·3 miles into the terminus, 2 min. 55 sec.; making 36 min. 55 sec. from Reading, 53 min. 40 sec. from Newbury, 53·1 miles; and 110 min from Westbury, 95·6 miles. From careful examination of runs under similar conditions of loading, I calculate the net time at 99 min., or 98 min. with normal running



Photo] [*W. H. C. Kelland.*

LONDON AND NORTH WESTERN RAILWAY.

Edinburgh portion of late 10 a.m. down Anglo-Scottish express *ex*-Euston near Lancaster
4–6–0 superheater "Prince of Wales" class locomotive.

imagined it possible, even in these times, to prevent such serious delays to the remaining expresses. Beyond Newbury speed ruled high, gradually increasing from 68 m.p.h. at that point to 69 at Midgham, 72½ at Theale and 75 at Calcot, after which the driver reduced to the extraordinary figure of 30 m.p.h. over Southcote Junction. The 15·3 miles from Newbury to Southcote took 13¼ min. 35 sec., and the 1·8 miles thence to Reading 3 min. 10 sec.

Recovering speed very rapidly from Reading we were doing 60 m.p.h. at Twyford and 69 at Maidenhead, but from there eased through Reading. Add this to the Taunton–Westbury net time of 54 min., and the result is a time of 152 min. from Taunton to London, or about 150 min. for a non-stop run. This was the fastest pre-war schedule for this 142·9 miles' journey, and such a performance at the present time, with a load of 400 tons behind the tender, reflects the greatest credit on the driver of *Evening Star*, even though we did reach Paddington 20 min. late. I had some other excellent runs on the Great Western Railway, especially between Shrewsbury and Pontypool Road, but

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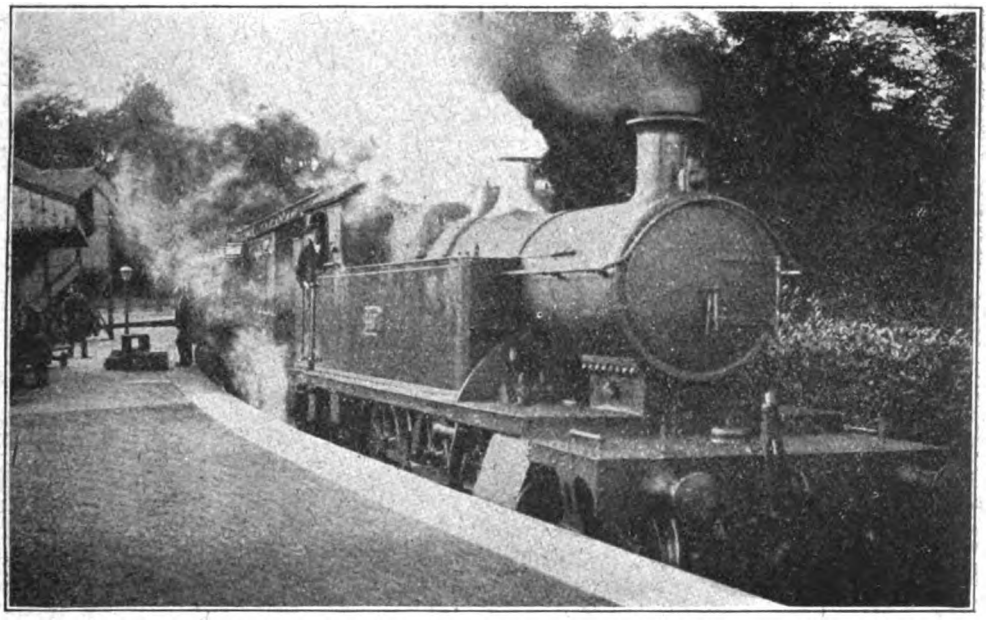
I must hold these over for future consideration.

Two magnificent efforts on the 5.30 p.m. *ex*-King's Cross, details of which reach me from a friend whose observations are always accurate and painstaking in character, are well worthy of record among 1917 achievements. On the first of these the load was gigantic for this booking, consisting as it did of sixteen 8-wheelers, weighing 431 tons empty, and not less than 460 tons inclusive; the engine was No. 1453, superheater "Atlantic." The first feature of note was the start, in that Finsbury Park, 2·5 miles, was passed in 6 min. 56 sec., despite the result the 41·2 miles between Hatfield and Huntingdon occupied 42 min. 51 sec. Falling to 49 m.p.h. on Stukeley bank (a very high figure seeing that the rate through Huntingdon was only 56), No. 1453 touched 76 on Ripton bank, and was still doing 62 at Fletton, with the result that Peterborough was passed in 17 min. 41 sec. from Huntingdon (17·5 miles), and 87 min. 14 sec. from King's Cross, or not over 84 min. net. The remainder of the run was spoiled by adverse signals all the way from Essendine to Corby.

On the second run engine No. 1456, of the same type, had one bogie vehicle less, or



Photo] [*F. Roberts.*

GREAT WESTERN RAILWAY.

Princetown branch train at Yelverton. Small 2–6–2 type tank engine.

initial rise at 1 in 105–110. Touching 53 m.p.h. at Wood Green, No. 1453 had not fallen below 41 on the 1 in 200 at Hadley Wood, but slipping in the last tunnel reduced the rate to 37 m.p.h. at Potters Bar, which was passed in 21 min. 20 sec. (12·7 miles). With a rapid recovery the 5 miles on to Hatfield were covered in 5 min. 2 sec., and a top speed of 72 m.p.h. was attained at the foot of the bank, but unluckily signals were on at Digswell, and this delay was only the precursor of further and much more severe permanent way checks at Langley and Tempsford. As a 445 tons full (420 tons tare load), and beyond a slower start to Finsbury Park, occupying 8 min. 51 sec., did even more noteworthy work. The maximum at Wood Green was 49 m.p.h., and the minimum at Potters Bar 36, the time to the latter point being 24 min. 17 sec., and to Hatfield exactly half-an-hour. Maximum speed beyond Hatfield was 74 m.p.h., and the minimum at Woolmer Green 55, but after Knebworth there came again the Langley check, the 14·2 miles from Hatfield to Hitchin taking 16 min. 48 sec. From there onwards, however, the running was tremendously fast.

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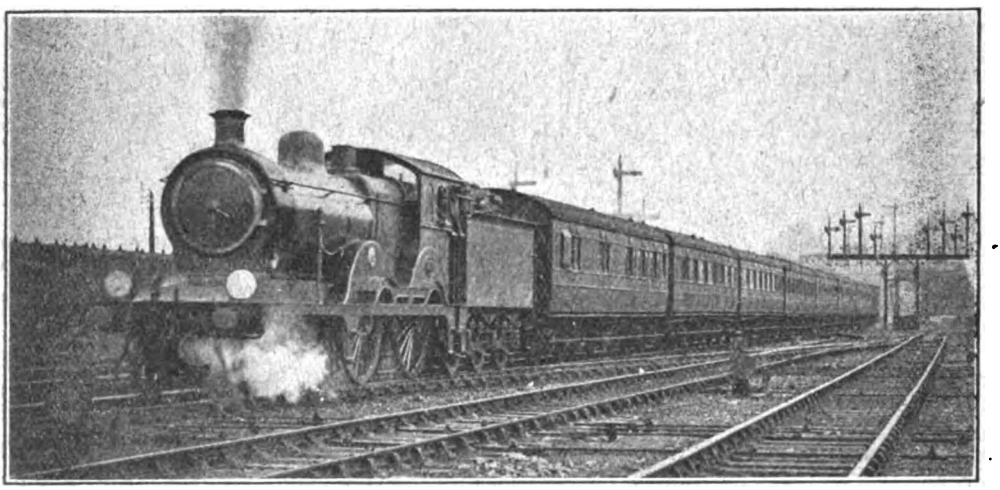
The top speed at Arlesey was 77 m.p.h., the minimum at St. Neot's 64 and the ensuing maximum at Offord 72; up Stukeley bank the lowest rate was 55 m.p.h., and then followed the exceptional speed of 80 m.p.h. down Ripton bank. As a result, the 12·2 miles from Hitchin to Sandy were reeled off in 10 min. 5 sec.; the 14·8 miles thence to Huntingdon in 13 min. 7 sec.; the 4·6 miles from Huntingdon to Abbots Ripton in 4 min. 47 sec.; and the 11·5 miles from Ripton to Fletton Junction in 9 min. 51 sec.—total 43·1 miles in 37 min. 50 sec., and with 445 tons behind the tender! Peterborough was passed in 86 min. 27 sec. from London, or 82½ min. net, but once again there ensued the signal checks beyond Essendine, spoiling be recollected that this train boasts the present fastest schedule in the British Isles between York and Darlington—44·1 miles in 45 min.—but this includes a conditional stop at Northallerton which, when made, obviously renders impossible the observance of such a booking. But on the journey under consideration, despite 55 sec. standing at Northallerton, the excess over booked time to Darlington was only 2 min. 40 sec., the net running time (exclusive of stop) not exceeding 43½ min. No. 2155, 3-cylinder superheater "Atlantic," was the engine, and the load totalled 217 tons net, or 230 tons gross. Beningbrough, 5·5 miles, was passed in 7 min. 37 sec.; Alne, 11·2 miles, in 12 min. 59 sec.; Pilmoor, 16·1 miles, in



Photo] [*F. E. Mackay.*

GREAT EASTERN RAILWAY.

Yarmouth express leaving Ipswich. 4–4–0 locomotive, No. 1830.

the conclusion of the run. One cannot forbear to note the frequency of this particular delay to so important an express as the 5.30 p.m. down, nullifying the effect of drivers' painstaking efforts south of Peterborough—whether arising from the late running ahead of the 4.20 p.m. *ex*-King's Cross or from whatever cause—and it seems a pity that some more satisfactory arrangements cannot be made to keep the road clear. I have details of a number of journeys on this train that were almost all similarly delayed, but must hold these over for a future occasion.

The continuation of one of the foregoing runs north of York yielded my friend his "star" performance on the North Eastern system, and was a fine piece of work. It will

17½ min.; Thirsk, 22·2 miles, in 22 min. 58 sec.; Otterington, 26·6 miles, in 26 min. 48 sec.; and Northallerton, 30 miles, was reached in 30 min. 50 sec. Maximum speeds were not recorded, as the run took place after dark, but it is worthy of note that the 21·1 faintly rising miles from Beningbrough to Otterington were covered in 19 min. 11 sec. After leaving Northallerton No. 2155 passed Danby Wiske, 3·7 miles, in 5 min. 40 sec., and Croft Spa, 11·5 miles, in 12 min. 56 sec., reaching Darlington, 14·1 miles, in 15 min. 55 sec.—a very smart piece of work indeed. Actual running time, York to Darlington, was thus 46¾ min., and net non-stop time, as previously stated, 43½ min. for the 44·1 miles' journey.

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From the North Eastern Railway I pass to the Great Central. I have had one or two trips on the latter line during the past summer, which I intend to describe in an early number, but they were piloted: indeed, practically every Great Central train I saw had piloting assistance, which was to me rather disappointing, as the loads were not at all excessive. Similar conditions, so far as I have been able to note, have prevailed also on the Midland line, despite the tremendous easing of the schedules. A naval correspondent, however, has furnished me with details of a fine trip on the 3.15 p.m. *ex*-Marylebone, on which the large superheated 4–4–0 No. 434, *Earl of Kerry*, had to deal with a load of eight of the heavy 60-ft. 8-wheeled cars, weighing empty 275 tons and loaded 290 tons. For even the decelerated schedule of the train concerned, this is a decidedly heavy load over so severely graded a main line as that of the Great Central Railway.

The mile-a-minute rate was first reached at Wembley Park, and Harrow, 9·2 miles, was passed in the good time of 14 min. 20 sec. from Marylebone; Rickmansworth, 17·2 miles, was breasted in 22 min. 50 sec. Load considered, the time of 11 min. 5 sec. for the 6·4 miles from Rickmansworth up to Amersham was good, seeing that the grade is almost uniformly 1 in 105; the lowest speed was 32 m.p.h. The 14·4 miles from Amersham down to Aylesbury took 14¾ min., the time from Marylebone to Aylesbury, 38 miles, being 48 min. 40 sec., to Quainton Road Junction, 44·2 miles, 54 min. 20 sec., and to Calvert, 48·8 miles, 59 min. 5 sec. On the long 1 in 176 ascent past Brackley speed fell to 42½ m.p.h. (rather a poor figure, this), the 10·5 miles from Calvert to Brackley taking 11 min. 50 sec., and the 9·8 miles thence to Woodford 11¼ min.—total 82 min. 10 sec. from London, 66·1 miles. With only 32 min. in which to complete the remaining 34 miles to Leicester, fast running was now imperative, and was realised in maxima of 78 m.p.h. on Catesby bank and 75 on Whetstone bank, the intervening minimum beyond Lutterworth being 53 m.p.h. So the 14·1 miles from Woodford to Rugby occupied 12 min. 50 sec.; the 6·8 miles thence to Lutterworth 6 min. 40 sec.; the 8·4 miles on to Whetstone 7 min. 50 sec.; and the last 4·7 miles into Leicester 4¼ min., by virtue of a very smart stop. Thus *Earl of Kerry* finished with ¼-min. in hand on the 114 min. schedule, after some excellent running.

In conclusion, I will mention a couple of experiences on the Great Eastern Railway, as both being worthy of inclusion in the record of 1917 achievements. I have made one trip on the 5.23 p.m. *ex*-Liverpool Street, with the standard 64-axle load, weighing 425 tons empty and 450 tons full; the engine was No. 1532, superheater 4–6–0. We took 9 min. 10 sec. to get through Stratford, 4 miles, making the customary slack there, and 17 min. 35 sec. to Chadwell Heath, 10 miles, but from Romford to Brentwood we suffered from slight signal checks (presumably from the 5.18 p.m. down Southend in front of us) and so fell nearly to 20 m.p.h. on Brentwood bank, taking 35 min. 50 sec. to pass Shenfield, 20·2 miles. From there, however, we covered the 9·5 miles to Chelmsford in 9 min. 50 sec., with a maximum of 62½ m.p.h.; the 8·9 miles from Chelmsford to Witham in 9½ min.; the 8 miles from Witham to Mark's Tey in 9 min.; and the 5·1 miles thence to Colchester in 5 min. 20 sec.; making a total of exactly 70 min. from London, or about 68 min. net. Maximum speeds were 60 m.p.h. at Witham and 61½ on Lexden bank; minima were registered of 46½ m.p.h. at Hatfield Peverel and 47½ at Mark's Tey, in addition to the prescribed slacks at Chelmsford and Colchester, which were carefully observed. On the sharp rise beyond Colchester we fell to 39½ m.p.h., while the minimum at Belstead was 39 m.p.h., but we touched 67 at Manningtree and 60 before Halifax Junction. The 7·8 miles from Colchester to Manningtree took 9 min. 20 sec., and the final 9·2 miles into Ipswich, including a slack over the water troughs, and a very slow drawing up to the platform, 11 min. 50 sec. Thus the total time for the 68·7 miles from London was 91 min. 10 sec., or about 89 min. net, *i.e.*, 2 min. over schedule, and although I did not proceed to Norwich on this occasion, I found subsequently that the lost minutes had been regained on the second stage of the journey, with the lightened load. Readers who are acquainted with the considerable difficulties of the Great Eastern Railway Colchester main line will appreciate the merit of the work just described.

The final run to be described was an extraordinary effort on the 3.42 p.m. up Cromer express from Colchester to London, allowed 73 min. for the 51·7 miles' journey—not, perhaps, an extravagantly difficult booking save under conditions such as these, when the load of the train last-mentioned *plus* a six-wheeler—67 axles, 436 tons

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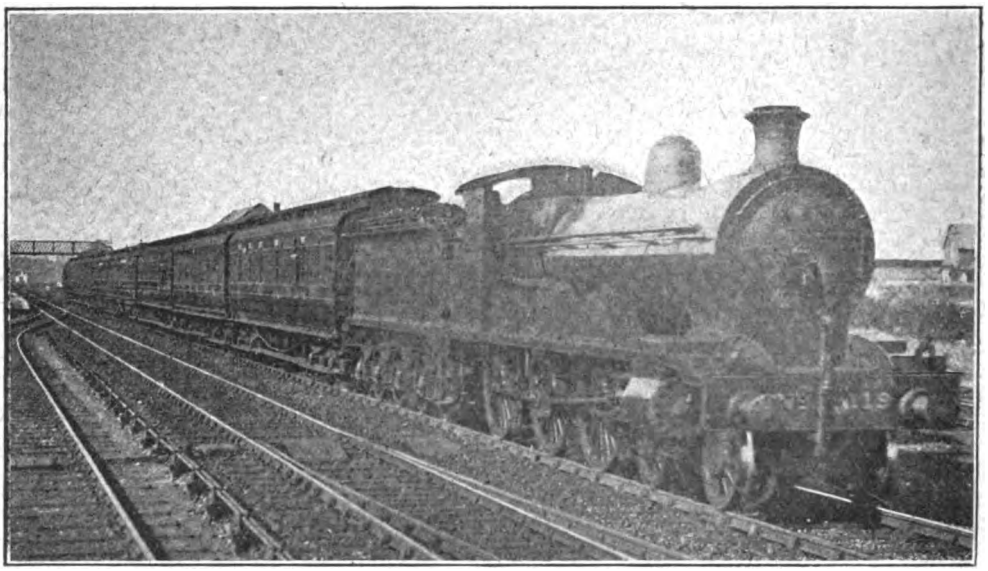
empty, and 465–470 tons full—was in charge of a 4–4–0 "Claud Hamilton" weighing 51 tons. If the tender be included, indeed, the aggregate weight of the train was all but 10 times that of the engine! No. 1845, now superheated, was the locomotive concerned. Out of Colchester the first 5·1 miles to Mark's Tey, including Lexden bank, took 10 min. 35 sec., and the succeeding 8 miles to Witham 10 min. 16 sec. Witham to the 8·2 miles Brentwood to Chadwell Heath 7 min. 33 sec.; the 6 miles thence to Stratford 6 min. 24 sec., making a total of exactly 63 min. from Colchester. Unfortunately the train was stopped by signal at Bishopsgate, and No. 1845 had a difficulty in re-starting; otherwise the journey would have been completed without difficulty in the 73 min. allotted, or even ½-min. less—a wonderful achievement for an engine of such moderate dimensions over a road like the Great



Photo] [*F. E. Mackay.*

GLASGOW AND SOUTH WESTERN RAILWAY.

Glasgow–St. Pancras express passing Gretna.
4–6–0 locomotive, No. 119.

Chelmsford, 8·9 miles, occupied 11 min. 37 sec., and the long uphill stretch from Chelmsford to Shenfield, 9·5 miles, 13 min. 7 sec. My correspondent took no stop watch times, but carefully read all the quarter-miles throughout with the ordinary second-hand of his watch, from which it appears that the minimum speed at Ingrave was 31 m.p.h. and the maximum at Harold Wood about 70. So the 2 miles from Shenfield to Brentwood took 3 min. 28 sec.; Eastern. At this stage I must bring my remarks to a close; I do not profess to have exhausted my available material, nor can I claim to have covered the ground of locomotive performance in 1917 at all adequately, but these few examples of running may serve to indicate the character of some of the running which is still taking place in these islands, and of which, in all the circumstances, we have every reason to feel proud.

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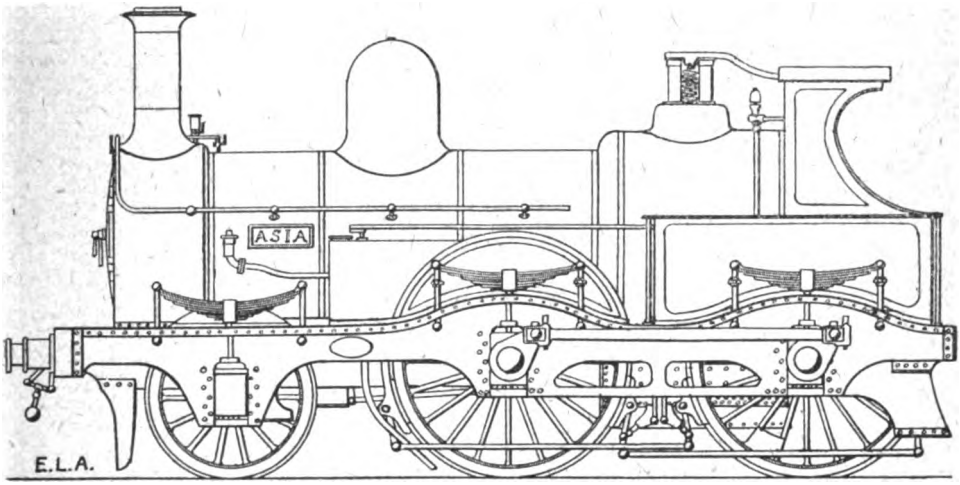
Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON, CHATHAM AND DOVER RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

RENOWN as the "Mail" engines, the last express locomotives built by Mr. Martley were among the most celebrated that ran south of London. They were Nos. 53 *Europa*, 54 *Asia*, 55 *Africa*, and 56 *America*, and were built in 1873 by Sharp Stewart and Co., Manchester, with 6 ft. 6 in. wheels and 17 in. by 24 in. cylinders. The standard boiler pressure was 140 lb., and the heating surface was 1,180 sq. ft.. of which the tubes supplied 1,080 sq. ft These engines weighed 36¼ tons in working order. The domes and Ramsbottom safety valve seatings were of polished brass, and the neat chimney tops had copper bands. The engines were painted medium green with black bands and red and white lines and the underframes were brown. It may be remarked here that until Mr. Kirtley's time these were the standard colours for the London, Chatham and Dover engines, though the "Europa" class were painted a lighter shade of green than many of the other engines. Mr. Kirtley painted all the engines of his own design black, from 1875 onwards, but the green colour was maintained for Mr. Martley's engines for some years longer until they were gradually rebuilt, and it was only in the middle "eighties" that the green colour finally disappeared.

Two engines similar to the "Europa" class were in hand at Longhedge works and were completed in 1876 after Mr. Kirtley took charge. These were Nos. 57 and 58 and never bore names.



MAIL ENGINE *Asia*, CLASS 53 TO 56.
Built by Sharp Stewart & Co., Manchester, in 1873.
Wheels 6 ft. 6 in. Cylinders 17 in. by 24 in.

The six engines of the "Europa" class, Nos. 53 to 58, worked the fastest expresses—the Continental Mails—between London (Victoria) and Dover for many years, and were quartered at Longhedge for this service. They were occasionally supplemented by the 2–4–0 engines 47 *Templar* and 46 *Champion*, and in 1882 No. 50 *Enigma*, the 6 ft. coupled engine was frequently to be seen on the boat trains. The "Europa" class also generally worked the Victoria–Queenboro' Pier boat expresses, though the

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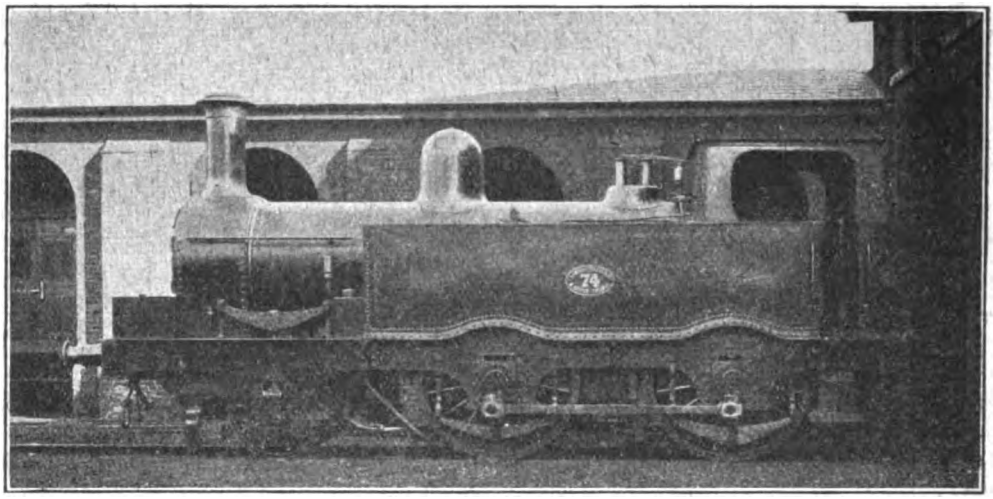

Photo] [*Locomotive Publishing Co., Ltd.*

2–4–0 TANK ENGINE, 71 TO 74 CLASS.
Rebuilt at Longhedge by Mr. Kirtley.

Kirtley 4–4–0 bogie express engines to be mentioned subsequently did occasional work on these trains. The "Mail" engines, 53 to 58, were provided with the Westinghouse brake for the Continental expresses, and were the only engines so fitted. At the end of 1876 the "Chatham" had 27 express engines, all with 6 ft. 6 in. coupled wheels except No. 50.

The most important trains were of course the Dover expresses. The old mail contract involved a fine on the Company if the trains were late, and it must be admitted that the "Mail" engines performed their part of the contract most admirably. In bad weather if the driver thought that he had not water enough to carry him through to Dover, he was allowed to stop at Faversham, but I do not know whether the time dropped in so doing had to be made up. The following was the timing of the early morning Continental Mail in 1878 from the working time book :—

Miles.		arr.	dep.
—	Victoria ..	—	7.40 a.m.
4	Herne Hill ..	7.47	7.50
8¾	Beckenham pass.	7.56	
17½	Swanley ,,	8.7	
34¼	Chatham ,,	*8.28	
44¾	Sittingbourne ,,	8.41	
52	Faversham ,,	8.51	
61¾	Canterbury ,,	9.3	
78	Dover Town ..	9.24	9.25
78½	Dover Pier ..	9.28	—

*One coach slipped.

The time allowed for the 74 miles from Herne Hill to Dover was 94 min., giving a running average of 47¼ m.p.h. This was a really good locomotive performance when the severe gradients of the line are taken into consideration. The trains were not heavy, and averaged ten to twelve coaches or about 120 to 140 tons from Herne Hill. The line into Holborn Viaduct station was opened in 1874, and a "City" portion of the main line expresses was worked thence to Herne Hill by a suburban tank engine, and attached there to the Victoria portion. This method of working applied to nearly all trains, and the main line engines ran to and from Victoria, so that it was only on occasional trains from the Kent Coast that I saw a tender engine on the section between Loughboro' Junction and Holborn Viaduct.

A few examples of the actual running of the older Chatham engines may be of interest. The following is the log of the evening Continental Mail express with 12 coaches and engine 57.

Miles from Victoria.			p.m.	
4	Herne Hill ..	dep.	8.31	
10¾	Bromley ..	pass	8.42¼	
12	Bickley ..	,,	8.44	
17½	Swanley ..	,,	8.50	
26¾	Sole Street ..	,,	9.0½	
33	Rochester Bridge	,,	9.8	
34¼	Chatham ..	,,	9.10	slack.
44¾	Sittingbourne	,,	9.23	
61¾	Canterbury	arr.	9.45	

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The run from Herne Hill to Canterbury (57¾ miles) was done in 74 min., a speed of 46·8 m.p.h., but exactly 48 miles had been covered in the first hour from Herne Hill. It must also be remembered that the severe curve at Rochester had to be negotiated at a very reduced speed.

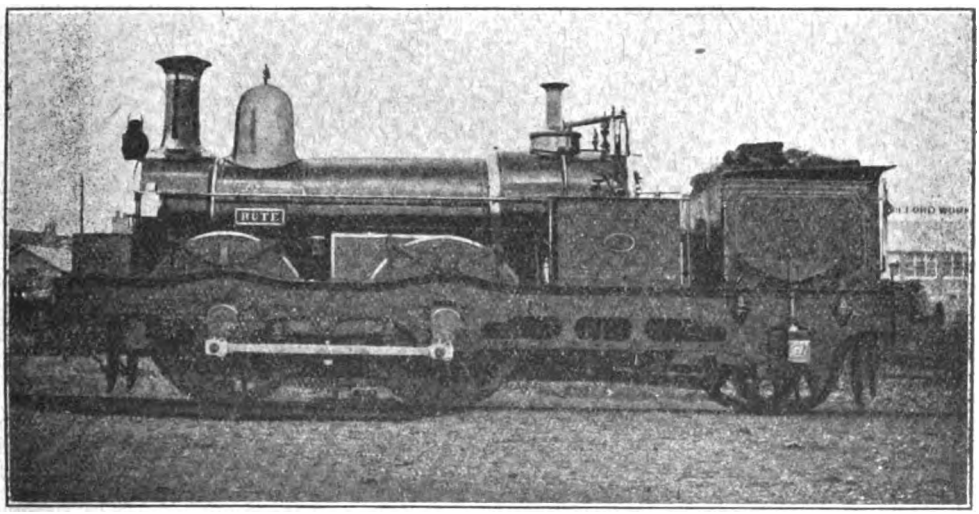
With engine 48 *Talisman* and an up Margate express consisting of 15 coaches, mostly however of the four-wheeled variety, the 28½ miles from Herne Hill to Chatham were covered in 42 min. (40¾ m.p.h.), and the run of 30¼ miles from Chatham to Herne Hill in 57 min., this last being a most mournful performance. The downhill run from passing Sole Street to passing Bickley was rushed at the "dangerous" pace of 14¾ miles in 27 min., and showed what the Chatham really could do when put to the test. It is just possible that the guard had warned the driver that some of the four-wheeled "dog-boxes" which he was piloting might possibly have fallen to pieces unless carefully handled. There may be some of my readers who, like myself, have in bygone days sampled the Chatham four-wheeled main line carriage, and if so they will appreciate my meaning. On another occasion the same engine *Talisman* with the morning business express which left Ramsgate at 7.25 a.m.—load again 15 "dog-boxes"—managed to run from Faversham to Herne Hill in 70½ min., a speed of 40 m.p.h., to the accompaniment of a lively shaking for the passengers.

But the "mail" engines of the "Europa" class frequently did some really smart running. *Asia*, with ten coaches, ran from Herne Hill to Dover, 74 miles, in 91 min., a running average of 48·8 m.p.h., which considering the gradients and the slack for the Rochester curve must be considered an excellent performance.

Mr. Rous-Marten recorded a run with *America*. No. 56 in 1884 on the morning Continental express with ten coaches, in which the run from the Herne Hill start to a stop at Chatham (30¼ miles) was made in 37½ min. The steep banks were ascended very pluckily and the downhill speed did not exceed 65 m.p.h. Also the 6 ft. coupled engine *Enigma*, No. 50, with eight coaches ran from Rochester to Bickley stop (22 miles) in 30½ min., this including the severe bank of 1 in 100 for 6 miles to Sole Street summit.

He also stated that in later times as rebuilt by Mr. Kirtley the older 2–4–0 engines did far better. No. 49, with 14 coaches or about 170 tons, ran from Faversham to Chatham start to stop, 17¾ miles, in 23½ min., but from Chatham to Herne Hill, 30¼ miles, the time taken was 43¼ min., by no means so good.

In one respect the Chatham differed materially from its South Eastern neighbour,



Photo] [*Locomotive Publishing Co., Ltd.*

0–4–2 BACK TANK ENGINE, NO. 82, *Bute*.

Class 81 to 94, known as the "Scotchmen." Built 1866 by Neilson & Co.
Coupled wheels 5 ft. 6 in. Cylinders 16 in. by 22 in. Fitted with Adams' radial trailing axleboxes.

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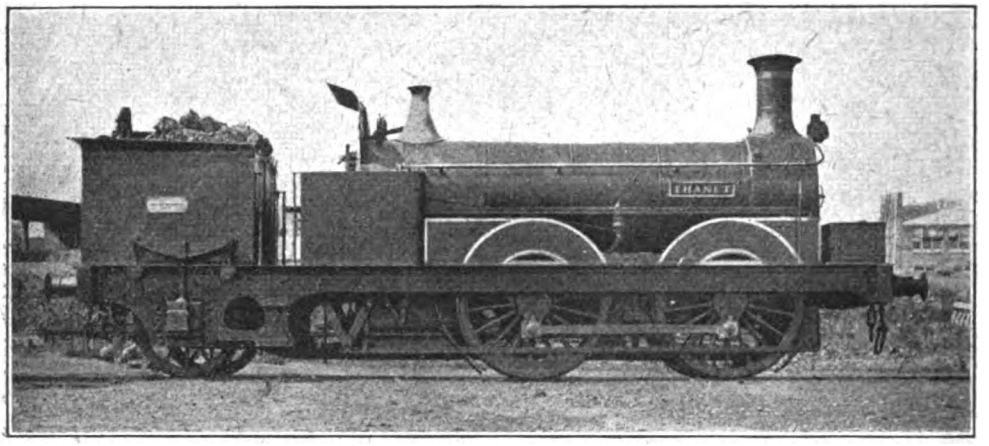

Photo] [*Locomotive Publishing Co., Ltd.*

0–4–2 BACK TANK ENGINE, *Thanet*.

Class 95 to 100. Built by Neilson & Co., 1873.
Wheels, 5 ft. 7 in. Cylinders, 17 in. by 24 in. Fitted with Adams' radial trailing axleboxes.

in that the heavy suburban and local traffic was worked entirely by tank engines. The Chatham railway was in fact one of the earliest in the country to appreciate the utility of tank engines, the employment of which on this line dated from 1858. By the end of 1876 there were no less than 60 passenger tank engines out of a total stud of 150 engines, and consequently the tender-first methods of the South Eastern on the suburban services were unknown on the London, Chatham and Dover line. Moreover this railway was one of the pioneers of the now usual "side" tank pattern. The first side tanks were of the 2–4–0 type with double frames, constructed by Messrs. R. and W. Hawthorn in 1863. They were very neat engines with polished brass domes, 5 ft. 6 in. wheels, and 15 in. by 22 in. cylinders, and were named *Rose*, *Shamrock*, *Thistle*, *Myrtle*, *Narcissus* and *Daphne* (subsequently Nos. 75 to 80). During the seventies these engines were quartered at various stations, and two or three piloted in the London district, and worked empty coach trains, etc. I think some completed their days on the Sittingbourne and Sheerness branch, one ran between Beckenham and Norwood Junction, and another worked the Sevenoaks branch from Otford Junction. *Myrtle*, 78, was for a long time shunting engine at Victoria. Four larger engines of a similar type, 71 *Aeolus*, 72 *Bacchus*, 73 *Vulcan*, and 74 *Comus*, which had been built at Longhedge in 1872–3, had 5 ft. 6 in. wheels and 16 in. by 22 in. cylinders. These engines were generally to be seen in the London district and frequently worked the City portions of the main line trains between Herne Hill and Holborn Viaduct. They were subsequently rebuilt with 17 in. cylinders and new side tanks as shown by the illustration of No. 74. Six very similar engines known as the "Sondes" class, in which portions of some old "Crampton" tank engines had been used, were fitted in Mr. Martley's time with condensing apparatus to work over the Metropolitan extension line. They were afterwards rebuilt in 1876–8 by Mr. Kirtley as Nos. 59 to 64, after which some of them such as 60 to 62 were regularly used on the Crystal Palace trains, but subsequently they were transferred to the short country branch lines in the Sittingbourne and Chatham districts.

Finally there was a fourth class of 2–4–0 side tank engines of a similar type with double frames, 5 ft. 6 in. wheels, and 15 in. cylinders. These had originally been tender engines which in the first days of the Chatham railway had been purchased from the Holland Rhenish Railway, for which line they had been built in 1856 by Sharp Stewart and Co. In their very early days they worked the Dover mail expresses, but afterwards were converted to side tank engines for London local work. At one time they were well known engines and were named *Onyx*, *Emerald*, *Diamond*, *Ruby*, *Amethyst*, and *Pearl*. For a short time they were Nos. 65 to 70, but when Mr. Kirtley rebuilt them in 1876–7 they were renumbered 145 to 150. I do not remember them myself on any work but piloting duties, and

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one or two of them were always to be seen at Victoria engaged upon the station shunting and empty carriage trains. They disappeared in 1889–1891, and their places were taken by new six-coupled side tank engines.

The most celebrated of the Chatham tank engines were however the well known "Scotchmen," so-called because they were named after the Scotch rivers and islands. They were really of Mr. Archibald Sturrock's Great Northern design, and were built by Messrs. Neilson and Co., 1866. They are illustrated on page 31, and it will be seen that they had double frames and back tanks, and the trailing axle was a radial one of the Bridges Adams pattern. The cylinders of the majority were 16 in. by 22 in., though four of them had 16½ in. cylinders, and the coupled wheels had a diameter of 5 ft. 6 in. They carried a boiler pressure of 135 lb. per sq. in. The names and subsequent numbers were :—

81	*Iona*	88	*Clyde*
82	*Bute*	89	*Kelvin*
83	*Jura*	90	*Spey*
84	*Arran*	91	*Annan*
85	*Islay*	92	*Tay*
86	*Staffa*	93	*Nith*
87	*Ulva*	94	*Esk*

The "Scotchmen" were immense favourites with the drivers, and it is not too much to say that for their size they were by a long way the smartest tank engines within the London area, and they could probably have shown a "clean pair of heels" to any tank engines in the same district, even twenty years after they were new. In their early days they worked over the Metropolitan extension, but in the middle seventies were replaced by heavier engines on this section, which includes the steep bank from Snow Hill to Ludgate Hill. From 1875 and for many years afterwards they took practically entire charge of the heavy suburban service between Holborn Viaduct and Bickley. This service included a fair number of fast trains, several of which ran between Ludgate Hill and Bromley without stopping. Almost the fastest of these was the 5.52 p.m. from Ludgate Hill due at Bromley at 6.10 p.m., and the following is a performance of No. 82 *Bute* with this train and a load of 12 coaches :

		p.m.
Ludgate Hill ..	dep.	5.53
Elephant	pass	5.56
Loughboro' Junction	,,	5.58¾
Herne Hill	pass	5.59¾
Dulwich	,,	6.1½
Sydenham Hill ..	,,	6.2¾
Penge	,,	6.4¾
Beckenham	,,	6.6¼
Shortlands	,,	6.8½
Bromley	arr.	6.10

The average speed was nearly 39 m.p.h., and from Sydenham Hill to Penge about 51 m.p.h. As far as I remember the "Scotchmen," provided with new boilers, were still at work on the Bickley services when the "Chatham" was amalgamated with the South Eastern. Engines do not last for ever, and I regret to say that these smart and pretty little locomotives have all disappeared, having been broken up in the early years of the present century.

Another series of 0–4–2 tank engines with Adams' radial trailing axle-boxes were built by Messrs. Neilson and Co. in 1873, viz. :—

95	*Albion*	98	*Cambria*
96	*Thanet*	99	*Mona*
97	*Erin*	100	*Scotia*

They were considerably larger engines than the "Scotchmen," and differed from them in having inside frames only for the coupled wheels, and domeless boilers, and were consequently known as "Long-backed Scotchmen." They bore such a striking likeness to Mr. Patrick Stirling's first Great Northern tank engines that I often wondered whether they had not been built from the same drawings. The coupled wheels were 5 ft. 7 in. in diameter, the cylinders were 17 in. by 24 in., and the boilers were pressed at 140 lb. I believe they were always considered good engines, but whether they had as good a turn for speed as the "Scotchmen" I am unable to say, since the nature of their duties hardly gave them so much scope. They were nearly always employed upon the services from Victoria to Moorgate Street and over the Metropolitan extension to Wood Green (Great Northern) and Hendon (Midland), and also on the Crystal Palace service. For many years they worked in turn with Mr. Kirtley's heavier 0–4–4 tank engines to be mentioned subsequently. But the "Albion" class had certainly one defect. The boilers had not sufficient heating surface, and provided a total of only 755 sq. ft. for 17 in. by 24 in. cylinders, compared with 853 sq. ft., the total heating surface of the "Scotchmen" with their smaller 16 in. by 22 in. cylinders. It was a case of carrying Patrick Stirling to extremes.

(*To be continued.*)

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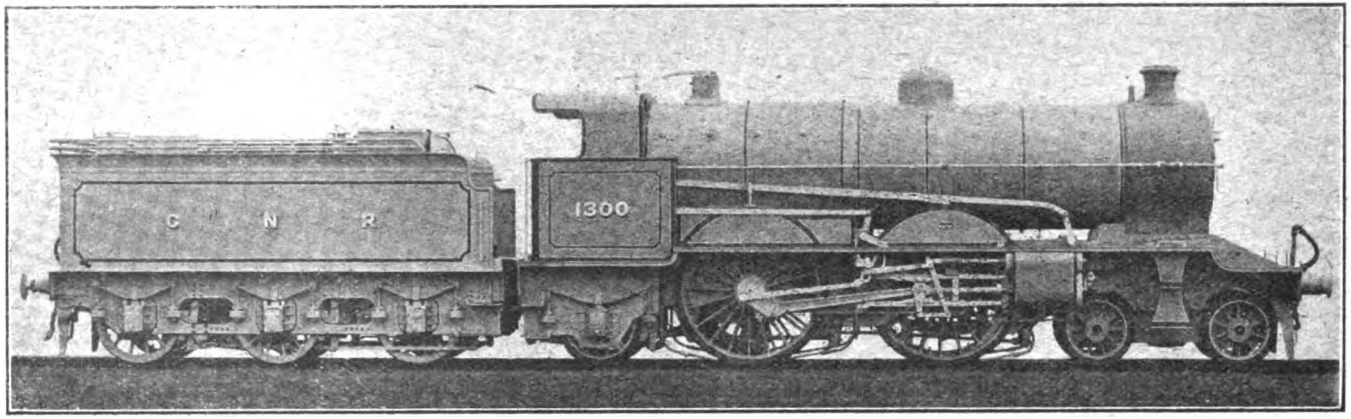

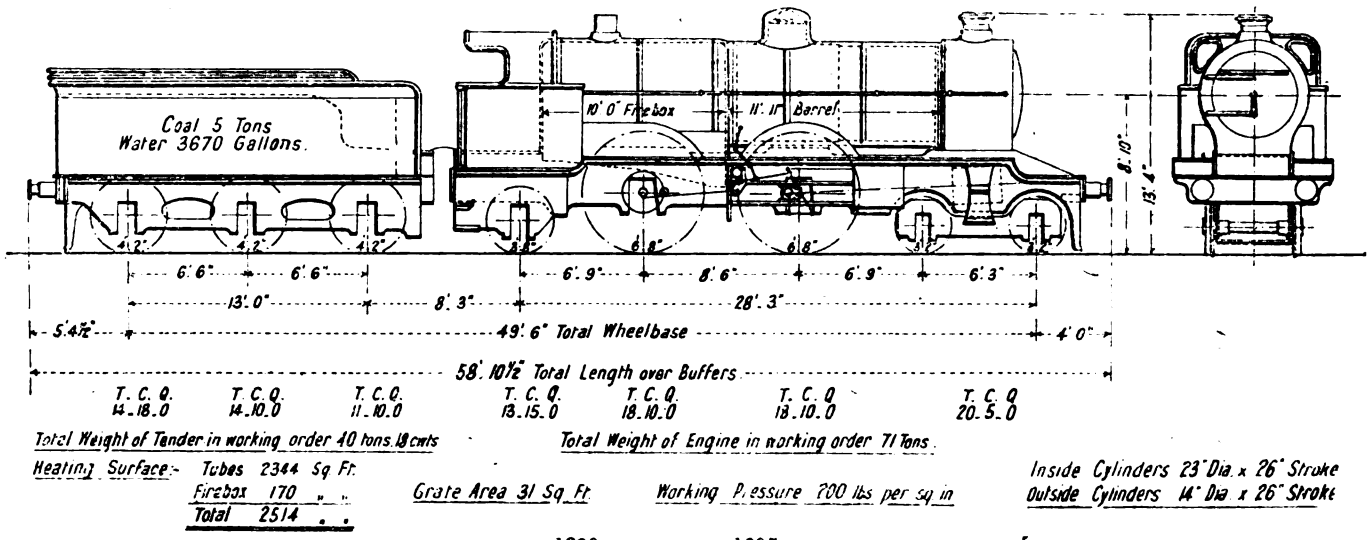

GREAT NORTHERN RAILWAY ENGINE, NO. 1300, BUILT IN 1905 AS A FOUR-CYLINDER BALANCED COMPOUND.

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Great Northern Railway Converted Express Locomotive.

MANY RAILWAY MAGAZINE readers will remember that in the year 1905 the Vulcan Foundry Company, of Newton-le-Willows, supplied the Great Northern Railway with a 4–4–2 type express passenger locomotive which they had designed and built in competition with other firms. At that time considerable attention was being given in this country to the subject of four-cylinder balanced compound locomotives, and in the same year the Great Western Railway took delivery of two additional French-built du-Bosquet de-Glehn locomotives, following upon the earlier example of the same class built to slightly smaller dimensions in some respects and known as "La France." Considerable success had been achieved with engines of this character on some of the French railways, and the Vulcan Foundry design was planned on the same general basis, namely, with outside high-pressure cylinders driving the hind coupled wheels and inside low-pressure ones driving the crank-axle of the leading coupled wheels.

This engine, No. 1300, of the Great Northern Railway has been running express trains on that system during the intervening 12 years, and for some time past it has been stationed at the New England running sheds of the company at Peterborough, known as the No. 2 locomotive district of the Great Northern Railway. Just recently the engine has left the Doncaster shops rebuilt as a two-cylinder simple, and by the courtesy of Mr. H. N. Gresley, Chief Locomotive Engineer, the RAILWAY MAGAZINE is enabled to reproduce photographs and dimensioned diagrams of the locomotive showing it in its original form and as now altered. No. 1300 is at the present time undergoing trial trips in the Doncaster district, and the present writer was recently privileged by Mr. Gresley to inspect the engine whilst under conversion in the erecting shop.

As now converted the engine uses superheated steam in two 20 in. by 26 in. outside cylinders driving the front pair of coupled wheels. In altering the locomotive the cylinders were removed, the front portions of the frames cut off and new portions fitted. The bogie centre was moved forward 3 in. and a pair of standard cylinders, exactly similar to those used on Mr. Gresley's 2–6–0 class locomotives, bolted to the frames at a point corresponding to the centre line of the bogie. The same boiler, wheels, frames, etc., are used. The wheel spacing, with the exception of the distance between the centre of the driving wheels and the centre of the bogie, is now slightly increased by the setting forward of the bogie as mentioned above. Reference to the diagrams will show that as now used the boiler has an apparently great decrease of heating surface. This, however, is more apparent than real, it being brought about by the fact that when the engine was first built the boiler was fitted with Serve tubes. These have been removed, their place being taken by ordinary boiler tubes $1\frac{3}{4}$ in. diameter, and superheater flue tubes $5\frac{1}{4}$ in. diameter. In calculating the area of the superheater tubes the internal diameter instead of the external diameter is now adopted.

The No. 1300 engine has always presented a somewhat striking appearance outwardly, and from the first it has represented a splendid example of British workmanship. The writer believes he is correct in saying that the firebox has been especially satisfactory, and, as before mentioned, the boiler has been retained and converted for superheated steam after 12 years of continuous service of a high-duty character.

The diagrams set forth the leading particulars of the engine in both of its forms. It will be noticed that there is, in the converted locomotive, a slight increase in the adhesion weight, whilst the engine itself as a whole weighs slightly less. The tender now fitted, however, conveys more coal but less water than heretofore; water pick-up apparatus being provided. The total wheelbase is extended by 3 in., with a corresponding increase in the length over the buffers. The tender weighs 43 tons 2 cwt. as against 40 tons 18 cwt., and the total weight of engine and tender in its present form is 1 ton 9 cwt. in excess of the original weight, *i.e.*, 113 tons 7 cwt. as against 111 tons 18 cwt., this being accounted for by the added weight of the tender.

As now running the locomotive looks extremely well, and the front end conforms to the latest Great Northern standard practice. See illustration on page 36.

The engine is fitted with the Wakefield mechanical lubricator with anti-carbonising device.

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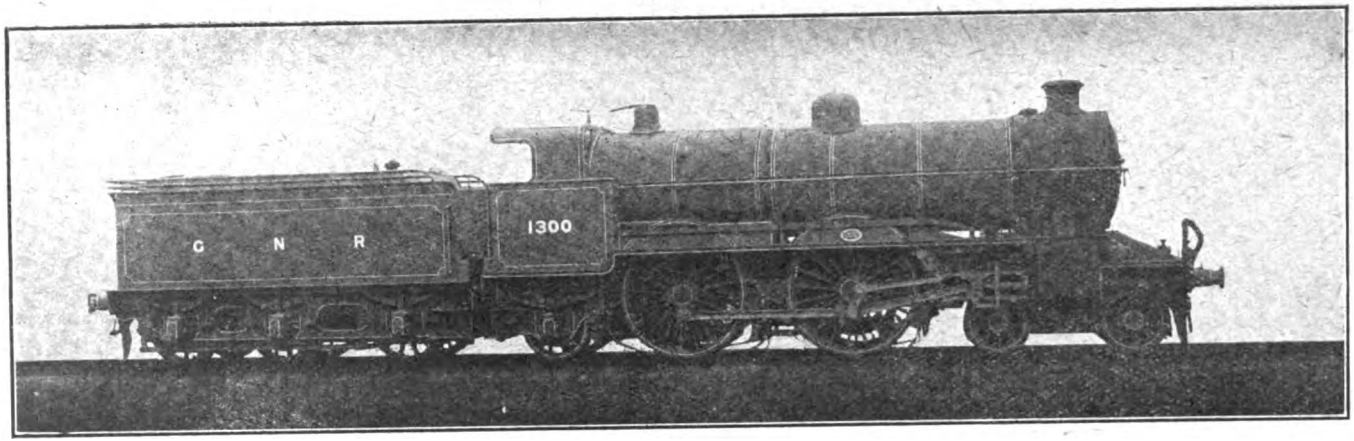

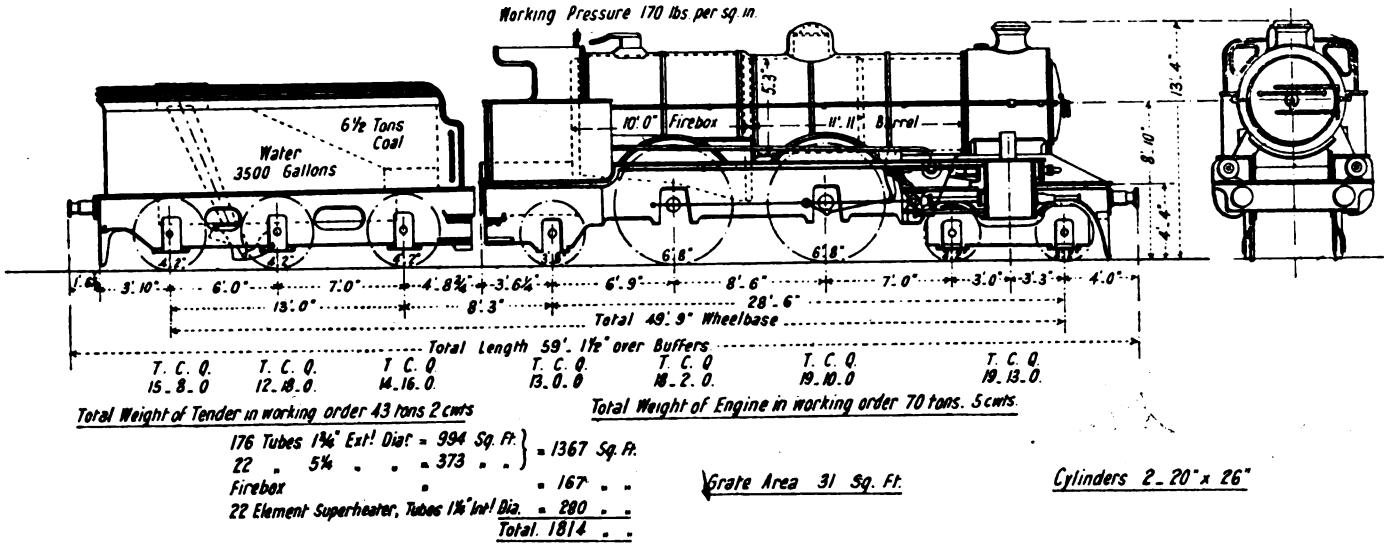

GREAT NORTHERN RAILWAY LOCOMOTIVE, NO. 1300, AS RECENTLY CONVERTED TO A TWO-CYLINDER SIMPLE ENGINE WITH SUPERHEATER.

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Railway Track Facilities and Improvements.

By CHARLES TRAVIS.

(*Joint Author of "Practical Railway Working," "Railway Operating Economics," etc.*)

WHILE it is obviously impracticable, within the limits of a single article, to touch even lightly on the many considerations involved in the question of providing adequate railway operating facilities, it may be well to review a few of the methods by which railway track facilities are supplemented and improved.

Effective train movement is almost entirely governed by the extent of the track facilities. Careful synchronisation of operating arrangements will certainly enable a line devoid of adequate accommodation to be utilised very profitably, but it is quite impossible for the most elaborately-designed operating methods to overcome the initial disadvantage of inadequate accommodation. This applies equally to both passenger and goods train movement, but as the former, apart from the difficulties inseparable from the conduct of a heavy suburban traffic, is relatively simple, it is not proposed to pay much attention to passenger train movement in the following remarks.

The transport maxim: "keep traffic moving" is the ideal kept in mind by all those concerned in the work of the operating departments, but it is one far from being realised. The heavily augmented freight traffic of recent years, coupled with the greatly enhanced power of modern locomotives, has led in natural sequence to a considerable increase in train loads, and, with this increase, railway operating facilities—despite their constant improvement—have never fully been able to cope. In this connection, one must necessarily admit that the many systems of "traffic control"—to use the expressive *Railway Gazette* term for the so-called "train control"—have done much to expedite train movement and to minimise standing time, whilst also affording, as a direct corollary, a more extended use of the points of accommodation. Yet we are still far from the time when railway working will be laid down to a set formula, and for many long years to come, trains will have to be put across the road, shunted into refuge sidings, or laid by in loops in order to allow of the passage of faster bookings, for the improvements necessary to avoid these troublesome forms of working, even were they physically possible, would cost enormous sums.

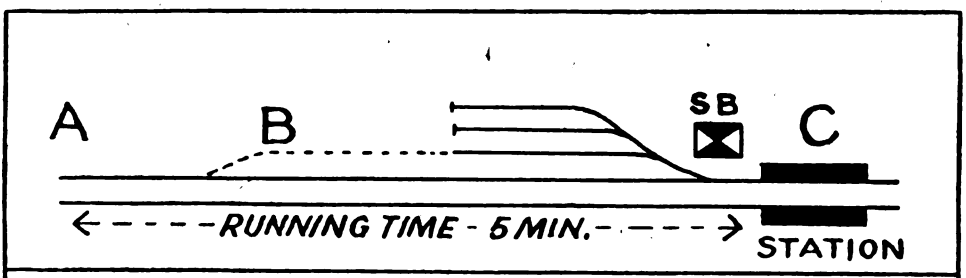

Fig 1—Refuge sidings with loop extension.

Now, this article is designed specially with a view to encourage interest in the subject of railway track facilities—a subject which, it may be said, does not receive the attention in the railway press that its importance deserves. Bearing this in mind, it is proposed to discuss the facilities adopted to render possible the most effective use of

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the main lines, to suggest where improvements might be desirable, and to illustrate the arguments with a few diagrams of *existing* track arrangements.

Punctual working is of prime importance in all railway arrangements, and particularly essential in districts of high train density, for a delay to one train might have a very detrimental and cumulative effect on the working of other trains. The possible train density being solely governed by line capacity, it is necessary, therefore, in busy districts, to take such measures as will render the accommodation sufficiently comprehensive and thus enable the main lines to be utilised to the utmost advantage. This can only be effected by a close study of the general traffic conditions of a railway. The fact that one section of line is so dependent on another section, and, further, that the efficient working of any one line is dependent, in many cases, on the ability of another to maintain its schedules, makes imperative the necessity for the careful consideration of proposed improvements.

There are three general methods of extending the capacity of a line. Apart from such palliatives as the installation of power systems of signalling, the provision of intermediate block posts and the like, the most obvious—and the most advantageous—is the widening of the line by the provision of additional roads, generally termed "goods roads" or "slow lines," for the movement of goods and mineral traffic. Once provided, it is a matter for consideration whether benefit will result from the sole utilisation of the main line by relatively fast trains and the allocation of the slow lines to the heavy freight trains, or, alternately, a carefully arranged combination of the two. Generally, however, it will be found that the latter method is preferable—at any rate, for some considerable time after the improvement has been effected.

Where additional lines cannot be provided, the alternative facilities are refuge sidings or loops. The former type of convenience usually meets all requirements on lines having a limited train density, though it should be observed that, as a train desiring to enter a refuge siding has to run a full train length past the trailing points and then be propelled into the siding, the time interval necessary for the train to clear the main line is unnecessarily prolonged, as compared with the loop convenience. Moreover, as a train, having "got the board" for the main line, has to re-cover the section of line twice previously traversed, there is a considerable utilisation of energy and time to no good purpose. With the enormous growth of modern freight train loads, moreover, the train length has so increased as to render impossible the accommodation of a whole train in many refuge sidings which, until recently, were quite useful as "lay by" facilities. Thus has arisen the necessity for the "breaking up" of long freight trains at many locations, and as, in some cases, it is essential to divide the train into three parts, it can well be understood that the operation is by no means conducive to the benefit of main line working.

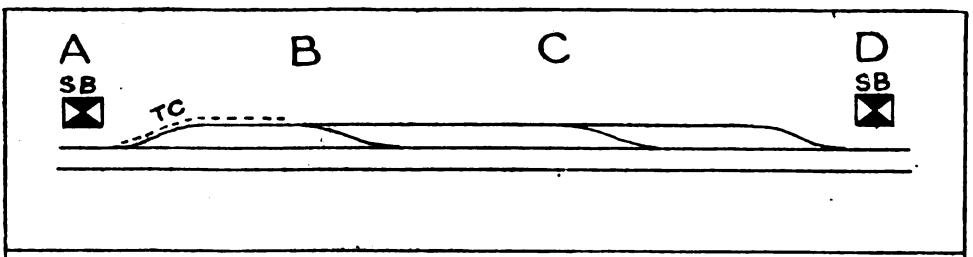

Fig. II—Loop extending from one signal box to another with outlets to main line. Track circuiting for maximum train length shown by dotted line (TC).

The many disadvantages of refuge sidings would, therefore, appear to indicate the greater utility of loops, which conveniences are, of course, essential on lines of high train density, for main lines must be relieved at the earliest possible moment. Take, for example, a group of three sidings placed at a station where the requirements of the working demand that a freight train shall be stabled temporarily. If the train has to be divided into three parts in order to find accommodation, it will be evident on

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reference to the diagram (Fig. 1) that the margin from A, including running time, will be 15 min., even if one makes the relatively small allowance of 10 min. for the three shunts at C, whilst the running out of one of the sidings into a loop (dotted line in diagram) would enable a heavy freight train to run from A and clear the road at B within 5 minutes or so.

In order to secure the most expeditious working, loops should always be given an adequate length, the term "adequate length" here being intended to imply a distance *exceeding* the maximum train length by about 20 per cent. to aid sharp clearances. In this connection, it might be said that the best utilisation is possible when the loop is of such a length that its facing points are operated from one signal box and its trailing points from another, whilst attention might also be directed to the advantage, in such cases, of track circuiting the loop line for the maximum train length from the inlet in order that the signalman controlling the facing points might always be in a position to know precisely whether he can take in another train. On such long loops, moreover, it is desirable, where possible, to insert connections with the main line. This might readily be done, as illustrated in Fig. 2, for A box could control the outlet at B, whilst D box could act similarly for C. The provision of such outlets to the main line is of great utility, for it might often happen, in the absence of such facilities, that the three trains in the loops are stabled in the reverse order of importance. In such a case, it would be quite impracticable for the most important train, stabled between A and B, to get ahead of the other trains unless it were backed out at A box—an operation not particularly desirable even where it is regularised.

In providing loop conveniences, the question of location should always receive careful consideration, for it is fairly obvious that where loops are constructed at points varying in distance (or, really, in running time) one from the other, the main lines—though being relieved by their existence—will not gain the greatest benefit. Where the loops on a busy stretch of line are evenly spaced, it is possible to arrange a fairly regular progression of trains, but immediately there becomes an extended section between adjacent loops, a certain amount of delay and an ensuing contraction of line capacity will undoubtedly result. For illustrative purposes, let us consider an existing track arrangement, as shown in Fig. 3. Trains leaving an important group of marshalling sidings at A run along the departure road B and then traverse the main line to C loop in 10 min., in which time they can, as a margin presents, pass from C to D. But as the margin necessary to pass from D to E is 30 min., there is a distinct contraction of main line capacity and a deplorable loss of effective train movement, for the retardation to the train awaiting the 30 minutes' margin obviously reacts on those in the rear and tends to involve congestion in the marshalling sidings, with a resultant effect "down the line." If, however, the margin between D and E were cut down to 10 min. by the extension of the loop D to the point DD, as shown in the diagram, this would very swiftly improve freight train working over this particular (and very busy) stretch

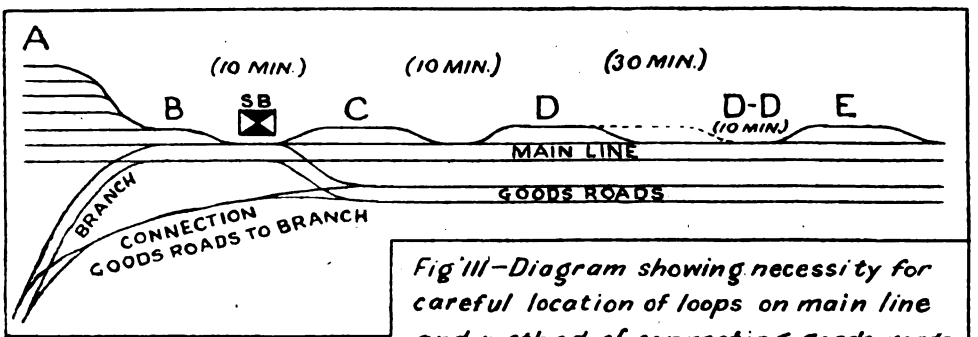

Fig. III—Diagram showing necessity for careful location of loops on main line and method of connecting goods roads and branch line in order to avoid occupation of main line on dense section.

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of line, for not only would it enable heavy freight trains to "get the board" for the main line at much more frequent intervals, but it would suffice to relieve the marshalling sidings by affording additional facilities in D loop for the accommodation of trains awaiting their turn for the main line. Thus, at a particularly busy time of the day, the extension might enable (say) 4 trains to pass through loop C to D and so extend the capacity of the siding group.

The diagram shown in Fig. 3 has also been utilised to indicate a further very useful method of avoiding main line occupation on a very dense section in the vicinity of an extremely busy station. On the east side of the station, two goods roads free the main line of goods traffic, but, as these lines terminated just before reaching the junction in order both to expedite the clearance of traffic and avoid expenditure. One instance of the necessity for improvement will suffice to illustrate this statement. A certain military camp railway handling several hundred wagons weekly is equipped with separate arrival and departure roads running from the siding group towards the main line connection which takes the form of a through road to the Down Main Line, and a connection to the Up Main Line by means of a single slip, as shown in Fig. 4. This arrangement would be much improved if an additional slip road were introduced between the Up Main Line and the sidings, for operation over the suggested slip road would obviate the present necessity for Up trains running past the connection, then setting back over the slip road to the

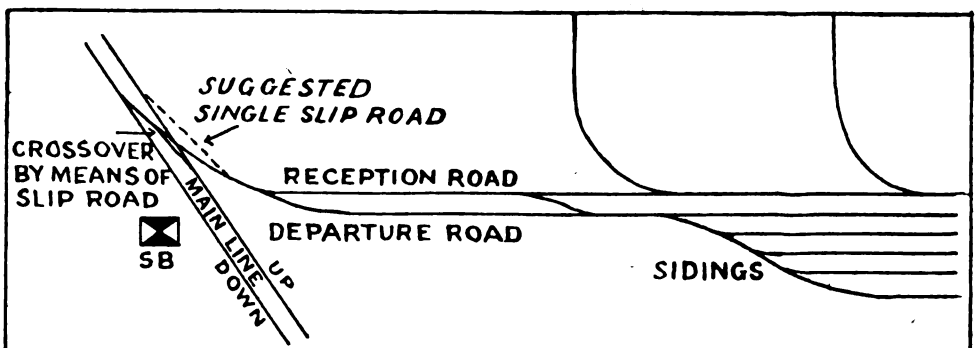

Fig IV– Connection with private sidings showing advantage of single slip connection making arrangement "Through road with double slip."

with the branch line, there was a distinct contraction of legitimate main line user by the necessity for the goods trains to run over the main line for a short distance. Accordingly a single line, used for both Up and Down goods trains, has been introduced between the Goods Roads and the Branch and, since its provision, has enabled goods traffic to or from the Branch to keep clear of the Main Lines. This short line has, therefore, served a distinctly useful purpose, and it is a method worthy of adoption at all locations where traffic conditions demand it and physical conditions permit of the construction.

Before turning to more complete forms of supplementing line facilities, one might mention the necessity of careful consideration of all connections with private sidings, Down Main Line and finally running over the through road into the sidings. The suggested slip is shown in the diagram by a dotted line and, as it could be fitted with all safety—the signal box is within 50 yards—it is difficult to understand the absence of such a facility. At present, the necessity of blocking both main lines on two occasions in order to enter the sidings causes waste of engine power and considerable delay—both matters of import in the consideration of improvements.

It is in the thriving industrial areas that serious difficulties often arise, and it is usually in such cases that the adoption of palliative measures are often impracticable. Where the existing roads are hemmed in by factories, warehouses, works and collieries, it is impossible to widen the lines

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or even to lay loops, except at enormous initial expenditure on land. In such cases, it has frequently been found desirable, and relatively economical, to provide separate avoiding lines for heavy through freight traffic. Termed "avoiding" lines because they diverge from the main line and join it again after skirting (and thus avoiding) the congested area, such useful supplementary facilities are being increasingly provided.

Avoiding lines may be of four designs. Leaving the line at grade, they may rejoin it at grade or by means of a flying or burrowing junction; alternatively, the latter plan might be reversed, whilst, if the train density were abnormally high, it might be advantageous to provide flying or burrowing junctions with the main line at both divergence and convergence of the avoiding line. Particularly where the congested area includes a large town, in the vicinity of which suburban services are maintained, is it advisable for such lines to be built, rather than to spend large sums of money in "patchwork" improvements on the old road; moreover, it would appear desirable, where the suburban and through passenger services are at all comprehensive, for the avoiding line to be built on one of the more complete plans—if physical and other conditions permit—and thus avoid any restriction of line capacity by reason of trains crossing over from the avoiding line fouling the main roads. A noteworthy line of this character is to be found near Doncaster on the Great Central Railway, as illustrated in Fig. 5. This was rendered necessary by the considerable delays occasioned to heavy coal and freight trains requiring to pass through Doncaster station *en route* for the East Coast ports. As will be seen on reference to the diagram, the avoiding line in this case leaves the line at grade and joins up on the east side of Doncaster by means of a flying junction.

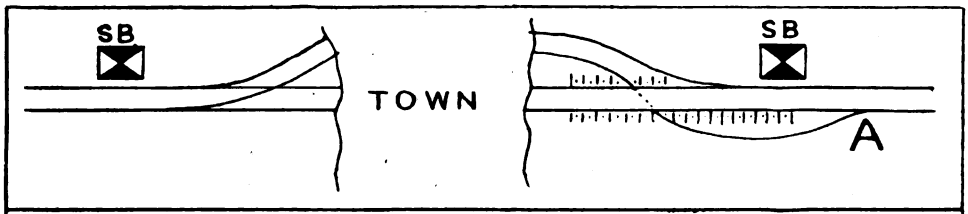

Fig. V—Avoiding line showing flying junction at A.

Before paying brief attention to the question of yard accommodation, one might further dwell on loop conveniences by illustrating the existing track arrangement at a London suburban station (Fig. 6). Termed a through station, with platform loops, it is built in this manner primarily to allow of suburban trains performing station duties whilst express trains are afforded the free use of the main lines, and for that purpose alone the design is of utility. But it has still further advantages, for the lines A-B and C-D are each long enough to accommodate a heavy freight train, whilst giving, by reason of the arrangement, sharp clearance facilities. Such a track lay-out, therefore, is of double utility, as tending to expedite the working of both passenger and freight traffic.

In order to cope successfully with the requirements of heavy freight traffic, it is absolutely essential to provide suitable accommodation in the way of additional roads, avoiding lines, loops, refuge sidings, etc., whilst it is equally necessary, if these facilities are to be utilised to the best advantage, to provide marshalling and concentration yards capable of accepting the traffic. The inter-relationship of yard and line operation is, in modern practice, too strongly remarked to need any general elaboration, but there is one factor associated with the question to which attention might be drawn—that is the limitation imposed on the effectiveness of line operation by the paucity of accommodation in yards and marshalling sidings. The enhanced train density of recent years has necessitated the provision of many costly operating facilities, but whilst these facilities have undoubtedly accelerated train movement to a considerable extent, it has been found impossible to attain the maximum utility of the improvements on account of the difficulty of proportionately enlarging yards and sidings to enable them more

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speedily to cope with the greater number of trains worked forward. Thus has arisen the necessity, in some cases, for trains which, had there been adequate accommodation in the yards, could easily have completed their journey, to be held up on running lines and in loops or sidings, with a resultant lengthy occupation and practical blocking of the road.

If there is one essential, above all others, in the lay-out of a marshalling yard, it is the provision of an adequate number of reception roads, as, where there is a paucity of such accommodation, the yard is very soon "blocking back." Under normal circumstances, refusal to accept by a yard of this character proves that something is fundamentally wrong, for if the line cannot expect to be relieved of trains when they are approaching such yards, it is a difficult matter to see where assistance can be provided. Moreover, the "block" soon extends to other yards, often less favourably situated to rid themselves of the consequent congestion, for it is usually of little utility, in that it represents wastage of engine-power and unproductive expenditure in trainmen's wages, to dispatch trains when it is known they cannot have a reasonable run. On the suitable provision of reception roads at marshalling yards, therefore, hinges the question of effective line operation. The length and number of the reception roads should, of course, depend on the length and number of the trains, whilst there should, in all cases, be a "margin of safety" to cope with unexpected demands. In other words, to secure the highest efficiency of operation and thus avoid delays as far as conceivably possible, the reception roads should be able to accommodate the maximum number of trains capable of presenting themselves within the over-all time needed to transfer wagons from the reception roads to the sorting, marshalling or departure sidings.

The factor of paramount importance in the consideration of improvements to operating facilities is the "increase of traffic," and it is suggested that this should determine the urgency of any improvement, rather than statistical proof of the cost of delays arising from the lack of a particular facility. When the latter is taken as the sole guide, it is probable that, as steps are taken on the basis then existing, traffic has so increased on the completion of the new work that still further provision is desirable. It will, of course, be argued in opposition to this statement that Capital should never be expended on additional facilities until the need for them is fully apparent. This, however, is well recognised, but it is submitted that reluctance to institute improvements may be carried too far, for cost statistics (compiled from somewhat arbitrary estimates of the monetary losses due to the lack of a particular facility) are quite unable to indicate the *real* cost, there being such questions as the reaction of the delays on other sections of the line and the possibility of congestion to be considered in the account. It is, therefore, rather a futile plan to delay improvements, for immediately it is clear that the *normal* train density is fast approaching the capacity of the available accommodation, the "increase of traffic" factor—if constant—demands that a "margin of safety" should be maintained, if delays and the ever-present evil of congestion are to be avoided.

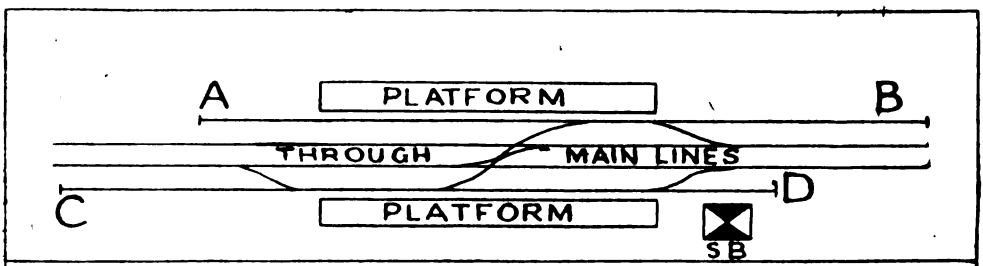

Fig. VI—Through station with platform loops and extensions. Lines A-B and C-D may be extended as convenience requires.

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The Financial Future of British Railways.

FROM the pen of Mr. W. J. Stevens, a subscriber to the RAILWAY MAGAZINE from its first number, and an occasional contributor to its pages, there recently appeared in *The Financial Times* an able article on the future prospects of British railways. After recapitulating the war terms arranged in 1914 between the railways and the Government, familiar to most readers of the RAILWAY MAGAZINE, Mr. Stevens went on to show that the economics in railway working under Government control result in financial benefit for the Government and not the railways. Then he disposed of the misapprehension prevailing in some quarters that the Government is making no provision for delayed repairs and renewals, which is the reverse to the truth. In fact, one important change wrought by the war in British railway finance is that the companies, instead of being large borrowers, are for the time being very large lenders, and will remain in that position until they are able to resume normal outlays on maintenance and renewals of their permanent way and rolling stock.

A HARD BARGAIN.

When all is said and done, however, says Mr. Stevens, the Government has driven a very hard bargain with the railways, and the experience of the latter is in marked contrast to that of other industrial enterprises. A summary published in the *Economist* shows that nearly all branches of industrial enterprise increased their profits substantially during 1916 and 1917, and are earning much larger percentages than the modest 4 per cent. earned on British railway capital. Many of these undertakings have also made and are making large bonus distributions on capital account. The dividends distributed on the Ordinary stocks of our railways have not varied much since 1913, but are slightly below the pre-war level. What is more serious is that the income-tax has been raised to 5s. in the pound, so that what the Government seems to give with one hand it more than takes away with the other.

Many thousands of small investors interested in Railway stocks are probably quite as much in need of war bonuses as the railway employees themselves, but they have not received them. On the contrary, their income is reduced, and over and above that reduction they are confronted with the increased income-tax. That the railway shareholders as a body have not complained is the most wonderful testimony to their patriotism that I know of, but whether it is altogether wise for the Government to treat the largest section of the investing public in so niggardly a fashion is another question, and, personally, I have no doubt that it reacts unfavourably on contributions to War Loans, etc.

WHY SHOULD RAILWAYS BE DIFFERENTIATED?

Why are our railways, who have rendered unrivalled services to the community during the war, treated on a different basis from all other industrial enterprises? What essential difference is there between the railway companies and shipping, for instance, that the shipping industry should have been allowed to earn enormous profits and the railways treated in such a cheeseparing fashion? It might be tolerable for the railway industry to submit to the existing arrangement, for which, after all, they have to thank their own directors, but it is high time that needless uncertainty as to the proprietors' future should be removed. They only ask for an assurance that after the Government arrangement comes to an end they will be allowed to adjust their charges to the public in such a way to meet, in a reasonable manner, their increased burdens in the form of wages bills, etc. To a large extent this new burden is already being met by fresh forms of economy, and which will, no doubt, be of a lasting character.

This should only make it all the easier for the Board of Trade to give the companies the necessary authentic assurances and to publish these in such a way as to remove the anxieties referred to. The 50 per cent. increase in passenger rates is, of course, an important item, quite apart from the abolition of the excessively cheap special fares charged in pre-war days. For example, on the basis of its pre-war revenue from passenger traffic, 50 per cent. increase in the case of the Great Western alone amounts to a sum of

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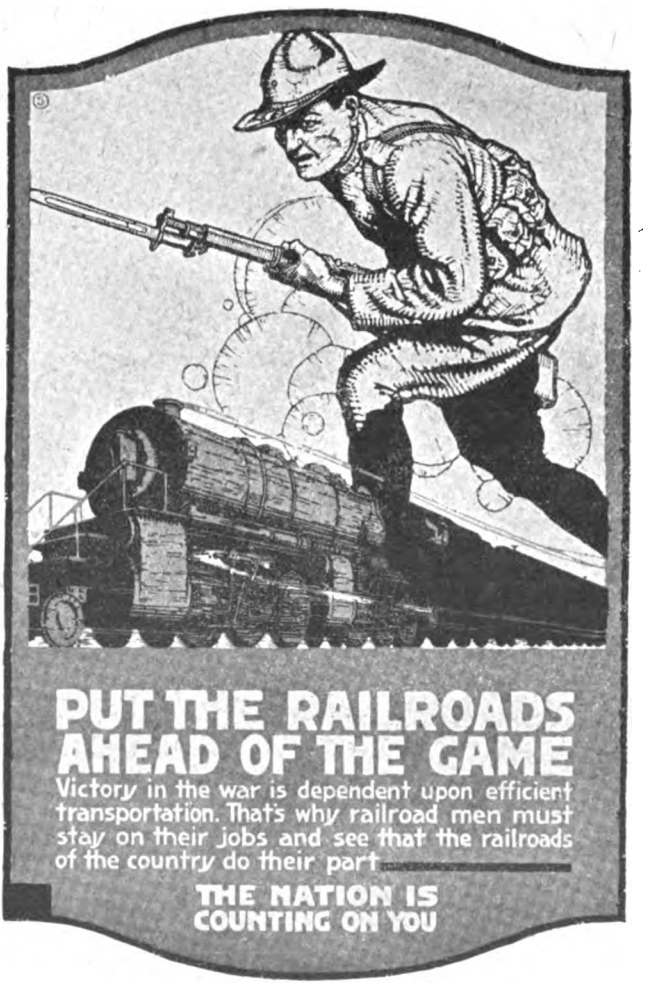
£2,700,000 per annum, while the total wages paid by that Company in 1913 amounted to about 4½ millions.

SUBMISSIVE SHAREHOLDERS.

It will be the fault of the shareholders themselves if they continue to submit to this needless uncertainty as to the future, and it is consoling, at any rate, that at the present time we have as President of the Board of Trade a man of wide experience in the administration of railways, and who is fully able to appreciate their requirements. Another sign of grace is the recent statement in Parliament that the whole question of the future of the railways will come under the consideration of a Special Committee appointed by the Board of Trade, on which the Minister of Reconstruction is represented. Fortunately the companies themselves will be strongly represented on that Committee, and it should do useful work.

Up to the present time, although the Government has driven a hard bargain with railways, it has not in any respect treated them unjustly, and most of the uncertainties with which they are confronted are based on the bold assumption that the Government will in the future treat this great industry unfairly. This I personally do not believe, but it is a standing disgrace, both to administrators of railways and to the Government itself, that a reasonable assurance of fair treatment in the future has never, so far as I know, been forthcoming. Why?



AN AMERICAN RAILROAD WAR POSTER.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, 30, *Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Correspondents are requested to write on one side of the paper only, and they must give their names and addresses, but a pen-name or initials may be inserted for Editorial use.*

Sir George Findlay.

Sir George Findlay died March 26th, 1893. He had not retired but was still General Manager of the London and North Western Railway. Born of Scottish parents in 1829, he was educated at Halifax Grammar School, and entered railway service in 1845, on the Trent Valley Railway from Rugby to Stafford. This line became part of the London and North Western Railway in 1846, but the future General Manager was not absorbed by the "premier" company until a much later date. In the interval he was engaged on lines in Wales, finally becoming Manager of the Shrewsbury and Hereford Railway. In 1862 the London and North Western Railway bought the Shrewsbury and Hereford and, as Sir George would laughingly say, he was taken over with the rest of the rolling stock. Once at Euston, his rise was rapid. He became Chief Goods Manager, then in 1874 was known as Traffic Manager, and finally received the title of General Manager. He made quite a name as a lecturer on railway subjects, and as a writer achieved some fame by producing a book entitled "The Working of an English Railway." It had a great vogue. Sir George was a Lieutenant-Colonel of the Railway Volunteer Corps and a great Freemason. His favourite sport was fishing, and he frequently visited Ireland to indulge it. He thereby acquired a close acquaintance with Irish railways, and this familiarity led him in the first place to tell the Royal Commissioners of 1886 that, if all the Irish lines were amalgamated into one system, he could manage the concern with four days' work a week and have the other two days to spare for fishing, and, further, we expect, the attempts of the London and North Western to establish itself as an Irish railway company. He received the honour of knighthood in 1892.

[Reply to "HISTORICUS."]

Obelisk on the London and North Western Railway Main Line.

This obelisk was erected in accordance with the requirements of the "London Coal and Wine Duties Act," 1861, and indicates the point where the railway enters the County of Middlesex. Following are extracts from Act 24 and 25 Victoriæ Cap. 42, which are of interest in this connection.

Whereas . . .

Act 14 and 15 Vict. Cap. 146.

An Act passed in the Session of Parliament holden in the Fourteenth and Fifteenth years of the Reign of Her said Majesty, intituled An Act to amend the Acts relating to the vend and delivery of Coals in London and Westminster, and in certain parts of the adjacent Counties; and to allow a drawback on Coals conveyed beyond certain limits; and which Acts are herein-after referred to as the Coal Duties Acts.

All the Directions, Powers, and Provisions in the said recited Act of the Fourteenth and Fifteenth Victoria, Chapter One Hundred and Forty-Six, with respect to, returns, Certificates, and Accounts, and to the erection of Boxes and Stations and Boundary Stones or Permanent marks on the Point of any Canal, Inland Navigation, or Railway, or any Turnpike or Public Road which shall be distant twenty miles from the General Post Office, and all other Matters and Things relating thereto, shall apply to Returns, Certificates, and Accounts, and to the Erection of Boxes, and Stations and Boundary Stones or Permanent marks on the point where any Canal, Inland Navigation, or Railway, or any Turnpike or Public Road, first enters or comes within the Metropolitan Police District.

[Reply to "DAN."]

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Some Great Western Railway Queries.

Chief gradients between Swindon, Gloucester and Severn Tunnel Junction, Great Western Railway, are the rise at 1 in 143–94 between Kemble and Sapperton Sidings, and the descent of over 3 miles at 1 in 90–60–70–75 thence to Brimscombe (up which all heavy trains are "banked"), continuing at 1 in 185–250 thence almost to Stroud. After that the line undulates without any very pronounced grades, the worst being the 1 in 168 rise to Chepstow and the 1 in 100 drop beyond. The service slacks are 40 m.p.h. over reverse curves on Brimscombe bank, 30 m.p.h. at Over Junction, over the Wye Bridge and curve at Chepstow, and also through Severn Tunnel Junction, together with various others in the immediate neighbourhood of Swindon and Gloucester. Between London and Birmingham the service slacks are 20 m.p.h. at Old Oak Common (to or from main or relief lines), 35 m.p.h. at High Wycombe (for one complete mile), 45 m.p.h. beyond West Wycombe, 45 m.p.h. for down trains and 50 for up at Ashendon Junction, 55 m.p.h. at Aynho Junction (down trains only), 60 m.p.h. through Banbury, 40 m.p.h. through Leamington (25 m.p.h. to platform line if slipping coaches), and 50 m.p.h. at Hatton North Junction.

[Reply to G. RODBARD.]

Locomotive Proportions.

Your question concerning the dimensions of certain London and South Western Railway engines as compared with the corresponding dimensions of certain types on other lines is one that is incapable of direct answer. Engines are designed in relation to the particular characteristics of the line or route over which they are intended to work, and as the various leading dimensions of locomotives are capable of almost infinite variation, designers have a free hand in adjusting these dimensions to suit the particular ideas they have in mind. It would be impossible to say that one designer is right and another is wrong in the way in which they proportion the parts of their engines to each other. The test of an engine's efficiency is seen in its ability to perform the work of its own line with a reasonably satisfactory adherence to the timetable under ordinary loading conditions, and a moderate fuel consumption and repairs bill.

[Reply to CADET P. L. B. WILLS.]

Power Reversing Gear.

Provision of power reversing gear is not so necessary in the case of piston-valve motions as it is where ordinary slide-valve motion is employed, as, with a large modern locomotive the pressure on the back of slide-valves of the ordinary pattern is very great, and certainly renders power assistance for reversing purposes desirable. In the piston-valve, however, this pressure is "balanced" in virtue of the shape of the valve, and where piston-valves are employed, therefore, screw reversing gear gives satisfactory results, unless the engine be of a type which frequently requires to be reversed. Power reversing gear certainly results in economy of labour and time, but we cannot agree that it effects economy in coal consumption; on the other hand, its maintenance is more expensive than that of screw reversing gear.

[Reply to "LOCOMOTIVE."]

Computation of Train-Loads.

We answered this question fully in the issue of last May, page 365, but may reiterate briefly that the most satisfactory method is to read the actual tare weights of the vehicles where this is obtainable; it can be found on the ends of the coaches on the London and North Western, Caledonian, Midland, Great Northern, North Eastern, North British and Glasgow and South Western Railways, and on the sole-bar, above the footboard, on the Great Western and London and South Western Railways. Failing this, a rough approximation for modern corridor stock is to multiply the number of axles by 7 for the tare weight, adding 5 to 10 per cent. for passengers and luggage according as the train is fairly well filled or packed to repletion respectively.

[Reply to RONALD H. MUIRHEAD.]

Compound Locomotives.

The root principle of steam propulsion is that of allowing steam at high pressure to expand in a cylinder and thereby perform useful work. In a compound locomotive this expansion is carried a stage or stages further, according to whether the engine has duple, triple or quadruple expansion cylinders. The steam obviously emerges from every cylinder of greater volume than when it entered that cylinder, and in order to accommodate this increased volume, the cylinders at each successive stage of the expansion must be correspondingly larger than those of the preceding stage. No more extended range of

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expansion than two-stage or duple expansion has ever yet been tried in connection with the steam locomotives. We have no record of the accident, to which you refer, on the Sao Paulo Railway of Brazil.

[Reply to B. GREENE.]

Webb 4-4-0 Compound Engines on the London and North Western Railway.

The late Mr. F. W. Webb designed two 4–4–0 classes, both 4-cylinder compound, the "Jubilee" class of 40 engines, and the "Alfred the Great" class of the same number. Both had L.P. cylinders 20½ in. diameter by 24 in. stroke; the former had 15 in. by 24 in. H.P. cylinders, and the latter 16 in. by 24 in. A number of these engines have since been rebuilt as 2-cylinder simples, but many are still running as compounds, some with their valve-gear so modified by Mr. Whale as to allow of independent cut-off for both sets of cylinders. A number of 0–8–0 and 2–8–0 4-cylinder Webb compounds are also still in service.

[Reply to R. W. P. HORSFORD.]

Locomotive Working London to Liverpool, London and North Western Railway.

Engines frequently work through Euston and Liverpool, London and North Western Railway. The non-stop expresses, such as the late 6.0 p.m. *ex*-Euston and the American Boat trains, were of necessity worked without change of engine between Euston and Edge Hill, and various other trains, both up and down, ran with the same engine between Euston and Lime Street. Certain expresses contrive to do so at the present time. There are three "Claughton" class engines stationed at Edge Hill shed, and these and other engines of this type frequently work in and out of Lime Street station.

[Reply to HORACE YATES.]

American Mogul Locomotives in Great Britain.

Of these locomotives The Baldwin Locomotive Works, Philadelphia, supplied 30 in all to the Midland Railway in the year 1899, numbered 2501–10 and 2521–40 inclusive, the intervening numbers —2511–20—being filled by the Schenectady "Moguls" of the American Locomotive Co. In the following year The Baldwin Locomotive Works supplied 20 engines of the same wheel arrangement to the Great Central Railway, and 20 more to the Great Northern Railway, numbered 947-966 and 1181–1200 inclusive respectively. All these engines have now been scrapped.

[Reply to J. P. BRIERLEY.]

Stumpf Cylinders.

Stumpf cylinders have their steam ports at the outer ends of the cylinder and the exhaust port in the centre, instead of using the same openings for inlet and exhaust, as in the case of an ordinary cylinder. For this reason the Stumpf cylinder is nearly twice the length of an ordinary cylinder having the same stroke, and the piston nearly equals in thickness the length of the stroke. The independent exhaust arrangements enable the exhaust ports to be made larger than normally, with the result that the exhaust is facilitated and back pressure is reduced.

[Reply to W. S. UPTON.]

The Exeter Railway.

One of the objects of the promotors of the Exeter Railway was that at some future time it might be extended from Heathfield *viâ* Ashburton to Brent, and so serve as an alternative Great Western Railway main line. But the gradients of the early part of the Exeter Railway are very heavy, while there would be little, if any, saving on the total distance traversed. Nothing further has been heard of this scheme for many years now.

[Reply to G. RODBARD.]

Load *v.* Grade.

It is hardly possible to answer such a question as "To what additional weight in train-load would gradients of 1 in 100 and 1 in 70 be equivalent?"—assuming that a comparison is intended with haulage on a level track—seeing that on the level the locomotive is only overcoming frictional resistances of various kinds, whereas on an up-grade the pull of gravity must be overcome, which involves a calculation on an entirely different basis.

[Reply to RONALD H. MUIRHEAD.]

Wirral Railway Locomotives.

An article on the locomotives and carriages of the Wirral Railway appeared in the RAILWAY MAGAZINE, August, 1902. This part has long been out of print. You do not give the number of the engine in which you are interested, but we presume you refer to 4–4–2 tank engine No. 1, built by Messrs. Beyer Peacock & Co., of Gorton, near Manchester, in 1892. If this is not so, please furnish further facts.

[Reply to HORACE YATES.]

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New Zealand Locomotives.

The description you enclose is curiously worded, but we assume that what is intended to be conveyed is that the tank locomotive illustrated, having a heavier adhesion weight, is able to utilise a greater tractive force than the tender engine, and that, rather than vary the design of the cylinders and motion, the expedient was chosen of raising the working pressure accordingly.

[Reply to C. L. CLIFFORD.]

Dimensions of the Great Western Railway Engine, "The Great Bear."

We do not undertake to give the dimensions of locomotives. See rules at the head of these columns. You can obtain full particulars concerning Great Western Railway engine, No. 111, *The Great Bear*, from the Great Western Railway Engine book, forwarded post free from the RAILWAY MAGAZINE office on receipt of 1s. 1d.

[Reply to A. CRAKE and others.]

Proposed Barnoldswick Light Railway.

You are evidently under some misapprehension as the application was made to the Commissioners in November, 1912, by the Barnoldswick Light Railway Company—a company proposed to be incorporated by the Order—and not by the Lancashire and Yorkshire Railway Company.

We are not in a position to say whether or not the scheme has been abandoned.

[J. BOND.]

Steam and Electrical Railway Working.

A very big subject indeed! Apparently you want all the suburban steam and electrical services compared over the last two years, and all the delays explained. The information you ask for it would be practically impossible to collect at the present time.

Your other question concerning signalling at Raynes Park is not at all clear.

[Reply to A. C. STONEMAN.]

Westinghouse Brake.

Hardly a day passes but the Westinghouse Brake Co., Ltd., 82, York Road, London, N.1, gets requests from men in the military camps both at home and abroad for instruction books, which are invariably sent them at once; in addition the firm frequently send parcels of such books and coloured diagrams to officers engaged in training the men.

[Reply to J. BLACKBURN.]

Nord-Belge Railway.

The line known as the Nord-Belge is that portion of the Northern of France Railway which is laid in Belgium. Crossing the Franco-Belgian frontier, it serves Charleroi, Namur and Liege. There is likewise a line included in the Nord-Belge system which runs from Namur southward to Givet.

[Reply to LIEUT. MELLOR, R.G.A.]

Engines for the Expeditionary Forces.

Over 500 locomotives have been sent out of the country for war service, but we are unable to supply details concerning particular engines. The locomotive you saw between Birmingham and Wolverhampton was probably one intended for service overseas.

[Reply to C. C. G. FILLMORE.]

Highland Railway Station Arrangements.

Most of the Highland stations are single line passing places possessing loops of such a length that it is inadvisable to control the switches at both ends from one signal cabin. Independent signal boxes, therefore, are provided to control each end of the loop.

[Reply to B. C.]

Great Western Railway Engine Names.

By referring to the new edition of the Great Western Railway Engine Book (price 1s., by post 1s. 1d.) you will find on page 41 that the locomotive named *Sir Arthur Yorke* is 4–4–0 No. 3418 and it belongs to the "Bulldog" class.

[Reply to H. S. TIBBITS.]

Locomotive Cylinder Stroke.

In view of the comparatively small size of locomotive cylinders, it would be very in convenient to adopt the marine practice of giving the stroke in feet; both diameter and stroke are always reckoned in inches.

[Reply to CADET P. L. B. WILLS.]

Midland Railway Locomotive Restrictions.

We are not aware of any restrictions on the number of engines which may be run coupled together over the Midland Railway, and very much doubt if there are any, so far, at least, as the main lines are concerned.

[Reply to K. S. THOMPSON.]

A Locomotive Problem.

The jet of steam you have seen escaping from under the footplate is probably from the injector overflow or waste pipe, and a small escape may often be noticed when the injector concerned is working continuously.

[Reply to W. S. UPTON.]

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Feed-Water Heating Apparatus.

The cylindrical apparatus on the frame over the bogie, of the London and North Western Railway locomotive photograph you have forwarded, is for the Weir Feed-Water heating.

[Reply to C. C. BURDGE.]

Mileage in "Bradshaw."

We cannot explain an alleged discrepancy in "Bradshaw." Why not communicate with the publishers of that useful periodical?

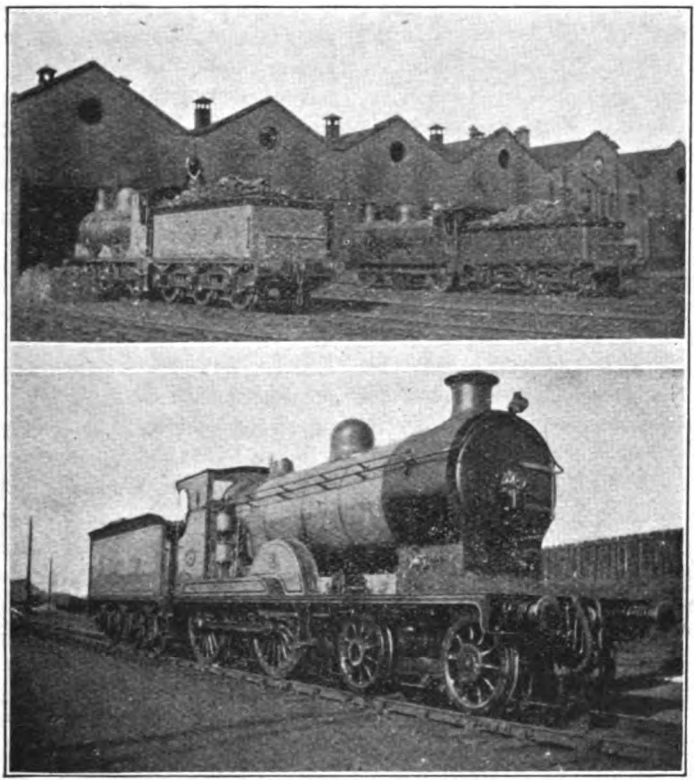
[Reply to B. STEWART BROWN.]

South Eastern and Chatham New 2-6-0 and 2-6-4 Engines.

Front and rear buffer beams are painted vermilion, the numbers being picked out in white.

[Reply to ARNOLD BLACK and others.]

LOCOMOTIVES AT CARLISLE.



Photo] [*A. G. L. Maclean.*

CALEDONIAN RAILWAY.

Top view illustrates Etterby (Carlisle) Locomotive Sheds and 0–6–0 engines Nos. 757 and 294.
Bottom photograph depicts 4–4–0 superheater locomotive, No. 121, designed by Mr. Wm. Pickersgill and built in 1916.

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The Bagdad Railway.

AS the Bagdad Railway has been much heard of for some years now, and will probably figure largely in politics in the future, interest will be taken in the following short description of it, as it was in 1913, written primarily for *The Balkan News* by a correspondent who signs himself " T.T." and who is one who has spent years on and about the line, working in connection with the company, and having facilities for seeing much of the construction, especially in the mountainous sections.

The Bagdad Railway proper starts from Konieh, but usually the Ottoman Railway, running from Constantinople to Konieh, is included in the term " Bagdad Railway." Starting, then, from Constantinople, we reach Haidar Pasha on the Asiatic coast by a good service of ferry steamers, and find the terminus a fine stone building with quays, offices and every convenience. On the train which leaves early in the morning, the first and second class are modern corridor carriages, but the third class is very rough. As there are no dining cars and the food at stopping places is not good, the traveller is wise to take a well-stocked lunch basket and plenty of water. Travelling is slow, averaging about 20 miles an hour, and as the trains are mixed, passengers and goods, they stop at every station taking on or leaving wagons.

The first part of the track skirts the coast of the Gulf of Ismit, which town is reached about midday, and a stop of an hour or more made for no apparent reason except that nobody (save a few European passengers) is in a hurry. Leaving Ismit we pass a chain of lakes on the left and a mountain range on the right, and climb through a pass to a higher plain, where we make the town of Eski Cher by nightfall. Here the tired passengers have to seek accommodation for the night in the various alleged hotels, where at meals they are continually worried by sellers of meerschaum beads, etc., from neighbouring workings. That trial over, they retire to seek rest, and are met by worries rather smaller than pedlars of beads, but more numerous and pertinacious, which demand the use of plenty of " Keatings."

The next morning the train starts at daybreak, climbs another pass to another plateau until Agiou Karahissa is reached, where the French railway from Smyrna meets the Bagdad Railway. After lunch at a very fair station restaurant we resume the journey along the base of another mountain range, until in the evening we cross a pass and arrive at Konieh, the ancient Iconium mentioned in the Acts of the Apostles. This town was taken by the Turks in 1079, who made it their capital ; it is still a large town with a fine station and a large station hotel run by the company, but generally empty. At one time there was an idea of bringing the English Smyrna-Aidin Railway to Konieh, but the Germans are said to have prevented this, as it would naturally have interfered with their monopoly.

From here the line runs south-east across the broad plain, gradually approaching the Taurus Range. The first place of interest is Tchoumra, where the Germans in 1913 had just finished a large irrigation scheme, spreading the water from the mountains over the arid plain by canals, etc. But I was given to understand that the sparse Turkish population, who were quite content as they were, refused to settle down and pay extra water rate to make the scheme a success. Passing through Karaman, we come to the lower plain of Eregli, which is very fertile and well watered, and so on till we approach the Pass of the Taurus, which in old times was always garrisoned to hold the " Cilician

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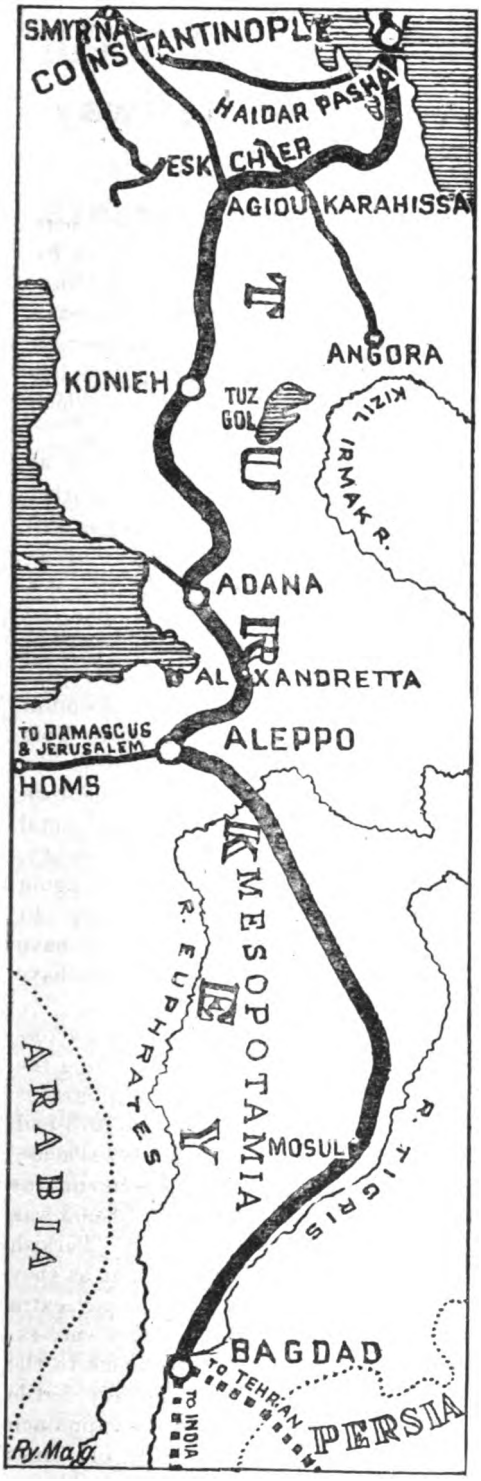

THE BAGDAD RAILWAY

Gates," the key to Syria. It was through here that Alexander the Great burst in 333 B.C. to reach his Persian foe, Darius III., and rout him in the valley of Issus. Leaving the Cilician Gates with their carriage road on the right, the line comes to Belemdjek, where the river running from above has cut a narrow, winding, precipitous gorge through hard limestone cliffs which often reach the height of 1,000 ft. sheer. Taking the line through this gorge was no mean feat, and, I believe, only completed this year; in 17 kilometres of road there are 12 kilometres of tunnels through the hard limestone. Near by are the silver-lead mines of Bulgar-Marden, which were worked continuously from ancient times down to a few years ago.

Leaving the Taurus the line descends into Syria to the plains of Adana, joining the Mersina–Adana line, which used to be a British company, but was bought up by the Bagdad Railway. From Adana the line runs nearly due east until it comes to Toprak Kale, just at the north-east corner of the Mediterranean, where a branch line goes south to Alexandretta, running on the sea coast for most of the way. The main line runs east a little further and then turns south and the second large tunnel begins, which pierces the Aminus Mountains at Bagtche. This tunnel is now reported complete; in 1913 it had just begun, and was in very hard quartzite, making progress slow. From here the line runs south for some 25 miles, behind the coastal range, and at the end mounts the hills on the left, passing over a large iron bridge and through a small tunnel to Radjou. From this place a section of the railway had been working for some time to Aleppo, where the Syrian Railway system connects with the Bagdad Railway. This section was opened before the mountain sections, as construction material could thus be brought up from Beyrout, and also no doubt it paid, as there is a good carriage from Radjou to Alexandretta and the distance can be done in one day. From Aleppo onwards the writer has not been, but from talking with various engineers, understands that the line presents no difficulties, and skirts the northern edge of the Syrian desert running through barren plains.

The total length of the Bagdad Railway is nearly 2,000 miles, and it was built in about 9 years' actual working, being stopped for political reasons for nearly 6 years. The cost was some £15,000,000, advanced mostly by the Deutsche Bank, the money being guaranteed by the Turkish Government.

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London and South Western Railway.

NEW GOODS ENGINES.

BY the courtesy of the London and South Western Railway we have pleasure in reproducing a diagram of ten goods engines now under construction at Eastleigh.

They are intended to haul trains of a maximum weight over the system, and will develop the greatest tractive force of any engine in the company's service. They have a boiler capacity sufficient to maintain the schedule speeds demanded by traffic requirements, and will be fitted with the "Eastleigh" superheater, Detroit sight-feed lubricator, the Gresham hot-water injectors, and feed-water heaters on the tenders.

The piston valves are of the company's standard design, and are operated by the Walschaert valve gear. It will be noted that the tenders are of large capacity, thus enabling trains to be run long distances without the necessity of stopping for replenishing supplies. It may also be seen that the engine and tender is duplicated in many respects with the passenger engines at present under construction and recently illustrated in the RAILWAY MAGAZINE. The design duplicates to a large extent with the mixed traffic engines built in 1914 to Mr. Urie's designs.

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British Railway Service and the War. [XXI.]

A RECENTLY issued statement of the London and North Western Railway war record is typical of the contribution of man-power for military purposes made by the railways of Great Britain. It is a record of which the London and North Western Railway service may well be proud, for, indeed, it is highly creditable.

The record shows that the total number of staff contributed by the London and North Western Railway for active service is 28,673, or 31 per cent. of staff employed immediately prior to the war. Of this number upwards of 450 have taken commissions. The casualties amount to 8,167, made up as follows: Killed in action, drowned, etc., 1,136; died from wounds, etc., 554; missing and presumed dead, 234—1,924; missing, 84; wounded, sick, etc., 5,936; prisoners of war, 223; total, 8,167.

THE LATE 2ND-LIEUT. PERCY FLYNN, OF THE ROYAL MUNSTER FUSILIERS.

Lieut. Flynn was formerly on the staff of the General Manager, London, Brighton and South Coast Railway, at London Bridge.

A summary of the various awards made to members of the London and North Western staff who have specially distinguished themselves whilst serving with the Forces shows that 304 members of the staff have been brought to notice in this way: Victoria Cross, 1; appointed Companion of the Order of the Bath, 1; appointed Companion of the Order of St. Michael and St. George, 1; appointed to Distinguished Service Order, 1; Military Cross, 11; Distinguished Conduct Medal, 58; Military Medal, 146; bar to Military Medal, 4; Distinguished Service Medal, 3; Meritorious Service Medal, 5; Albert Medal, 1; Mentioned in Despatches, 75; Medal and Certificates of Royal Humane Society, 1; otherwise brought to notice for valuable services, 23; French Awards, 6; Russian Awards, 6; Italian Award, 1; Belgian Award, 1; Serbian Awards, 3; total, 348. Several Awards have in a number of instances been made to one individual.

A second edition of the Honours List of the London, Brighton and South Coast Railway has been issued. It shows the number of war honours and decorations awarded to the company's staff on active service. The number of names now appearing is 33, which shows an increase of 19 on the first edition issued in May, 1917.

At London Bridge and elsewhere the news was received with sincere sorrow of the death of 2nd-Lieut. Percy Flynn, of the Royal Munster Fusiliers. Lieut. Flynn was formerly in the General Manager's Office of the Brighton Railway Company at London Bridge, where he was very popular, and his death is greatly regretted. A brother officer in writing to inform Mrs. Flynn of her husband's death, says:—"He was wounded twice before during the morning, but

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continued to lead his men on, displaying the utmost bravery, when he was killed by a bullet in the forehead. He was loved by his men, and not only I, but the whole company, feel his death very much."

STAFF LIEUT. W. A. STEEL, R.E.

Lieut. Steel was in the service of the London and South Western Railway.

A portrait of Staff Lieut. William Albert Steel, R.E., appears on this page. He received a Commission on May 2nd, 1917, was gazetted on June 12th temporary 2nd-Lieutenant for duty with the Inland Water Transport. On November 6th he was gazetted Staff Lieutenant, 1st Class, as from September 20th, 1917. Lieut. Steel was in the service of the London and South Western Railway, and assisted Mr. Hedge, the Outdoor Goods Manager, in general operating for nearly four years. He has proved very efficient, and is acting as Railway Transport Officer at an important centre in France. He is still under the Directorate of the Inland Water Transport.

Many RAILWAY MAGAZINE readers learned with regret that 2nd-Lieut. Alfred Boxall, one of the officers of the Great Western Railway Constructional Company, had been killed by an enemy shell while carrying out work in an advanced position in France. At the time of joining the Colours Lieut. Boxall was an assistant on the staff of the Great Western Railway Divisional Engineer at Shrewsbury, and previously was for some time in the Chief Engineer's office at Paddington. He was the youngest son of Mr. G. Boxall, for many years the Company's Chief Cashier.

2ND LIEUT. D. H. F. MEACOCK, R.E., SALONICA.

In railway life Lieut. Meacock was a member of the London and North Western Railway headquarters' staff.

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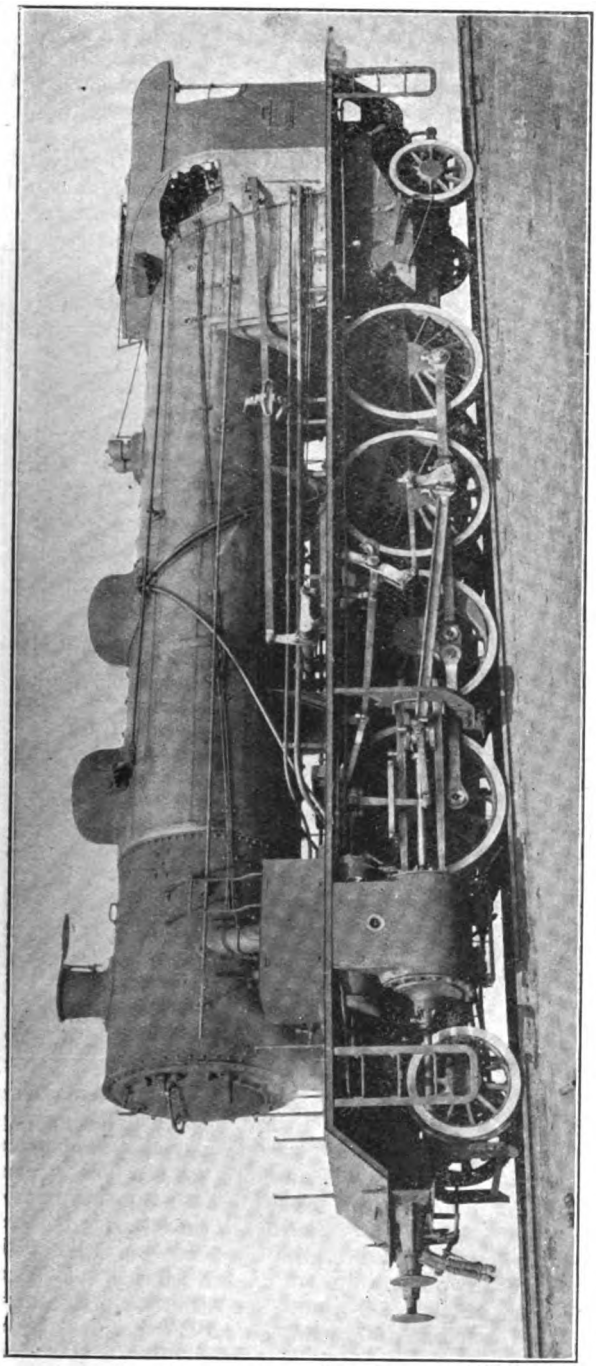
American Locomotives for France.



A LARGE number of 2–8–2 locomotives, have recently been delivered to the Paris, Lyons and Mediterranean Railway by The Baldwin Locomotive Works. The engines are four-cylinder compounds built to large proportions. Steel fireboxes are fitted, these being of the wide type. The high pressure cylinders are placed between the frames and the low pressure ones outside, the connecting rods of the latter driving the third pair of coupled wheels whilst the second pair has a crank axle with which the high pressure connecting rods engage. The steam distribution valves of the inside cylinders are driven from the outside links through the medium of rocking arm shafts attached to the radius rod. The inside eccentrics, links, etc., are, therefore, dispensed with, but the combination or lead levers uniting the inside cross-head with the corresponding valve spindles are, of course, retained. It follows from this that the cut-off from the two pairs of cylinders is necessarily inter-connected and does not admit of independent adjustment, only one reversing mechanism being required as a consequence.

The engines are similar in most respects to some previous ones built in France for the same railway and which have given highly successful results. In this order the Baldwin Company have supplied the engines alone, the tenders being constructed by the railway company. This order has since been increased, the later one requiring tenders as well as engines.

The engines are designed for working goods and mineral trains weighing 1,300 tons at a speed of 28 miles per hour on the Paris, Lyons and Mediterranean main line.

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Exhibition of Ambulance Train on the Lancashire and Yorkshire Railway.

UNDER the supervision of Mr. Geo. Hughes (Chief Mechanical Engineer), the Lancashire and Yorkshire Railway, as announced in the December RAILWAY MAGAZINE, recently constructed at their Newton Heath Works, to the order of the War Office, a further Ambulance Train (No. 42) for use on the Continent.

The complete train consists of 16 carriages, with a total length of 314 yards and weighing when loaded 530 tons. Vestibuled throughout and fitted with electric light and fans, of double doors being arranged on either side near the centre of the car, with ample space inside for the easy manipulation of stretchers.

Each ward car has its interior finished throughout in white enamel, and carries a supply of 162 galls. of water, two six-gall. tanks for drinking water being fixed near the centre of each ward. Both fixed and portable electric fans are provided; a small bracket and electric plug are arranged opposite each cot for the portable fans to be used for "gas" cases.

WARD CAR SHOWING ATTENDANTS' COMPARTMENT AND LAVATORY.

the train exterior is painted khaki with a red cross on both sides of each vehicle. A good supply of water is carried, the total quantity being 3,200 galls. Steam heating is provided on all cars, together with the Westinghouse automatic air brake. Special ventilation is arranged by means of louvre frames covered with gauze, which may be used instead of the side drop windows.

There are ten wards, nine of which are fitted with 36 cots each for lying-down cases, or a total of 324 beds, the other ward having 24 cots for infectious cases. The cars are each 56 ft. long and 9 ft. wide, a pair

Two straps are fixed on the outside of each bed to safeguard the patient in transit. Other interesting features are the numbering of the cots as in ordinary hospitals, camp stools for nurses, and portable stools for lifting the patients into the top berths, also a small drop table fitted to the side of the car. The cots in all the ward cars are arranged in three tiers, as compared with two tiers in trains for service in Great Britain. Owing to the variation in the cases received for transfer to the hospital base, the cots have been designed so that the centre tier may be hinged down to form a

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back to allow of the bottom cots being used as seats, thus doubling the accommodation; at the same time, the top tier of beds may be used for lying-down patients.

It is interesting to note that all the mattresses are filled with wood fibre, and one flock and one feather pillow supplied for each cot. At the corners of the floor the linoleum is well rounded, and this method is adopted throughout the train for hygienic purposes. In addition to the fitting of side drop windows and louvre frames for ventilation, a large number of air extractors are placed in the roof of the ward cars. Lavatory and cupboard accommodation are provided at the end of each of these vehicles. Ice is stored in the brake van and stores car, which also has a meat safe and ample provision for the conveyance of food, a desk being fitted for the storekeeper.

The pharmacy car is divided into five compartments, consisting of a ward fitted with eight cots for serious cases, spaced so that stretchers may be placed upon them, pharmacy, office, bath room, and stores. It is placed in the centre of the train with ward cars on either side. The pharmacy has ample space for patients waiting to be dressed, and is fitted with cupboards, a folding table, and a hot water heater and sink.

One of the special features of the train is that a patient can be carried on a stretcher from any of the nine ward cars into the pharmacy, the minimum gangway being 2 ft. 6 in. wide, or from the outside of the car direct into this vehicle. The pharmacy car has water tanks of 300 galls. capacity, and three drinking water tanks of 6 galls. capacity. The office is provided with a table, chairs, cupboards, safe, and other necessary fitments. The bath room has a white enamelled bath, with cold water supply, and a steam jet to heat the water.

KITCHEN CAR, KITCHEN LOOKING TOWARDS REFRIGERATOR.

A soiled linen cupboard is fitted at the end of the car opposite the stores.

There are two kitchen cars, 56 ft. long by 9 ft. wide, containing kitchens 20 ft. long by 8 ft. 3 in. wide inside; one car has a linen store, officers' pantry, cooks' room, sitting room for sick officers, and bath room, and the other car has in addition to the kitchen a personnel mess room, stores for officers' kits, and mess room and lavatory for non-commissioned officers.

The staff car gives accommodation for four medical officers and four nurses, and is provided with day and sleeping compartments.

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The medical officers' mess room at one end of the car is fitted with a dining table and chairs, together with cupboards and shelves, also an electric fan. At one end is a lounge, which can be arranged as a bed if required. There are three compartments with berths for the medical officers immediately adjacent to their mess room, entered from a side corridor. The berths are arranged on one side of each compartment, and the seat portion can be drawn forward to make up a berth. On the opposite side is arranged a wardrobe, writing table, net rack, book shelves and a chair.

A mess room for four nurses is at the other end of the car. A feature in this vehicle is that, in addition to the ordinary heating apparatus, a self-contained stove and hot water system is fitted to heat the car when standing in sidings on account of the staff living regularly on the train. The remainder of the personnel have accommodation in a separate car, and 33 cots are provided of similar design to those in the ward cars, so that the car can be used for carrying patients in emergency. A self-contained heating apparatus is also fitted as in the staff car.

Composition of ambulance train :—

No. of Cars.	Accommodation for
1 brake van with 4 infectious wards	24 infectious lying-down cases. 1 train guard.
1 staff car	4 medical officers. 4 nurses.
1 kitchen car with sitting room for sick officers	3 cooks. 10 officers.
4 ward cars	144 lying-down cases.
1 pharmacy car	8 lying-down serious cases.
5 ward cars	180 lying-down cases.
1 kitchen car	2 non-commissioned officers.
1 personnel car	33 orderlies.
1 brake van and stores car	1 train guard.
16 cars with total accommodation for	414 persons.
With the bottom beds in the ward cars used for sitting-up cases the accommodation is increased to	646

The Lancashire and Yorkshire Railway were the first company to place an ambulance train on view to the public, the occasion being in July, 1915, at Liverpool (Exchange station). In February, 1916, a second train was exhibited at certain principal stations in Lancashire and Yorkshire, which was inspected by a large number of people.

Having in mind the success attending the exhibition of the train, Sir John Aspinall arranged for the latest train to be on view to the public at certain important places, the tour including Barnsley, Manchester, Rochdale, Wigan, Southport, Liverpool, Bury and Huddersfield.

A staff of nurses from the Manchester and district auxiliary hospitals, including members of the American Ladies' Red Cross Committee, were in attendance on the train throughout the tour, with the exception of the exhibition at Liverpool.

The Red Cross Society and the St. John Ambulance organisation in each of the towns visited kindly provided detachments of nurses, who assisted in the sale of tickets of admission to the train, whilst local members of the Lancashire and Yorkshire Railway Ambulance Corps rendered assistance.

At Liverpool the staffing of the train and the sale of tickets was very ably carried out by a number of prominent lady workers under the direction of Lady Barr and Miss M. I. Aspinall, and amongst the 5,600 people who inspected the train were a number of American Navy and Army officers.

During the time the train was on exhibition upwards of 35,000 people took the opportunity of making themselves acquainted with the method of conveying wounded soldiers between the fighting line, the base hospitals and the ports on the Continent.

The highest attendance for one day was at Huddersfield, when over 7,000 persons paid for admission.

The exhibition at Liverpool was opened by the Lord Mayor, at Manchester by the Lady Mayoress, at Barnsley, Rochdale, Wigan, Bury and Huddersfield by the Mayor, whilst at Southport the Mayoress officiated at the opening.

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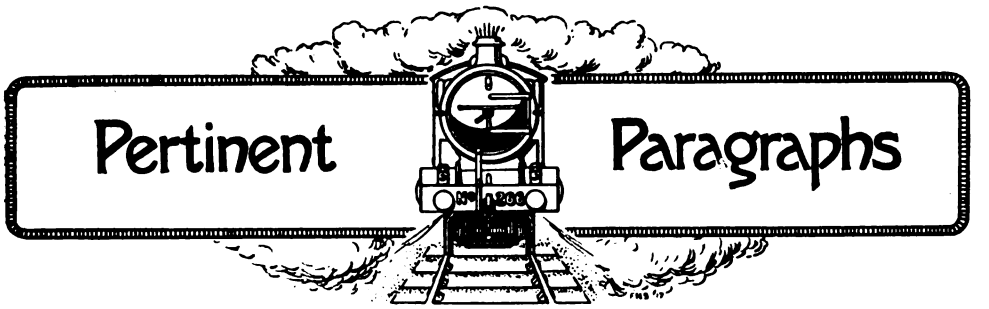

Our Colour Plate.

Following the Railway Magazine custom, of several years' standing, of giving in the New Year number one or two special Scottish features, on this occasion a colour plate of North British Railway 4–4–0 engine, No. 411, *Dominie Sampson*, is the predominant Scottish characteristic of the issue.

The locomotive pictured in the frontispiece is the standard express main line passenger engine, designed by Mr. W. P. Reid, Locomotive Superintendent of the North British Railway, 20 of which have been built at the company's works at Cowlairs, Glasgow. The engines are numbered in the usual way and are also named after characters in Sir Walter Scott's novels. They are fitted with Robinson superheater (24 elements), the cylinders being provided with piston valves 10 in. diameter with inside admission, and operated by the usual type of Stephenson link motion with rocking shaft. The lubrication of the piston and valves is effected by a Wakefield mechanical lubricator, fixed to a bracket bolted to the platform and worked by a lever connected to the motion block. An automatic snifter valve is also fitted to each steam chest. Automatic relief cocks, set to open at slightly over boiler pressure, are fitted to each end of the cylinder, also drain pipes connected to a four-way cock operated by a handle on the footplate. The driving axles are built up, the journals being 8½ in. long and 9 in. diameter. The wheels are of cast steel. The engines are fitted with the Westinghouse brake and a vacuum ejector of the Dreadnought type, the two being connected with a combination cock, air sanding, steam pressure reducing valves for carriage heating, two 3½ in. diameter safety valves, two No. 9 combination injectors, two sets water gauge cocks, and screw reversing gear. The regulator is fitted with double valves, the main valve of gun-metal and a relief valve of cast-iron. The boiler, which is 5 ft. diameter, is made up of steel plates with a front tube plate of best Yorkshire iron, copper firebox and stays, and steel tubes. The firebox is 6 ft. 8½ in. long outside, and 4 ft. 1 in. broad, allowing a clearance of ¼ in. on each side between the frames. The crown of firebox is stayed with mild steel stays fixed to the copper plate with best Yorkshire iron set screws and slung by case-hardened iron pins from steel channels rivetted to the outside covering plate. The firebars are supported by cast steel brackets fixed to the ashpan, it being supported by studs screwed into the foundation ring. All the space between the boiler and clothing plates is filled up with magnesia blocks covered with millboard, also the firebox back plate above the footplate. The tender is of the six-wheeled type with well, and contains 4,235 gallons.

Following are the numbers and names of the North British Railway engines of this class :—

No. 409 *The Pirate.*
,, 410 *Meg Dods.*
,, 411 *Dominie Sampson.*
,, 412 *Laird o' Monkbarns.*
,, 413 *Caleb Balderstone.*
,, 414 *Dugald Dalgetty.*
,, 415 *Claverhouse.*
,, 416 *Ellangowan.*
,, 417 *Cuddie Headrigg.*
,, 418 *Dumbiedykes.*
,, 419 *The Talisman.*
,, 420 *The Abbot.*
,, 421 *Jingling Geordie.*
,, 422 *Kenilworth.*
,, 423 *Quentin Durward.*
,, 424 *Lady Rowena.*
,, 425 *Kettledrummle.*
,, 426 *Norna.*
,, 427 *Lord Glenvarloch.*
,, 428 *Adam Woodcock.*

The Wakefield Lubricator.

In earlier days introduced largely to meet the special conditions involved by the use of highly superheated steam, the Wakefield lubricator is now the most extensively used apparatus of its class on the home railways, and in a considerable measure also in the Colonies and in South America, still mainly for superheater engines, but to a growing extent for those employing saturated steam. It is also finding favour in European practice in competition with the best Continental makes of apparatus. The lubricator is designed to supply oil regularly and in due proportion to the varying conditions of working, and in successive patterns has been steadily improved in detail by the makers, without altering the main features of construction and operation. While providing a sufficiency of lubricant at all times it is not extravagant. Indeed, it is estimated to realise a substantial saving of oil—an important consideration in these days—and the pistons and valves are kept running with entire freedom from carbon deposit, the later designs being specially constructed to overcome the slight drawbacks which earlier types had from the tendency towards deposition of carbon occasioned by the action upon the oil which sometimes results from the great heat

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of the steam, so that this difficulty is now satisfactorily met.

Messrs. C. C. Wakefield and Co., have also applied the principles of force-feed lubrication to locomotive axleboxes, with notable success. In this and kindred applications considerable lubricant economies are also realised—as high as 50 per cent. in proved instances—and hot boxes no longer cause trouble where such apparatus is installed. This fact alone entitles the Wakefield appliance to special consideration on the part of railway companies, in view of the shortage in engine power, and the daily necessity for working engines nearly, if not quite, to their full capacity; while at the same time ensuring that time out of service shall be reduced to a minimum.

Traffic Control Problems.

At the second of the current winter series of Operating Efficiency meetings held under the auspices of the London Underground Railways and the London General Omnibus Company, Mr. H. E. Blain, Operating Manager, presided over an attendance of about 150 of the control staffs.

A paper, "Some notes on Traffic Control Problems," was read by Mr. J. E. Cowderoy, Chief Clerk of the Traffic Research Section. He made a critical review of methods of organisation adopted in connection with traffic control both on surface and underground transit systems. The inevitable changes of method consequent upon the evolution of transit undertakings from one-man business to large organisations were alluded to. A plea was put forward for the continued recognition of the value of practical outside acquaintance with traffic conditions and requirements, and a change in road supervision, from a district system to a route system, which it was suggested, would assist to the institution of more efficient time-tables, more regular running, and a better road and staff control. The increasing difficulties in connection with time-table preparation were alluded to and certain duty systems discussed. The writer deprecated the system of a permanent storm schedule for adoption in bad weather, as he considered that this was liable to turn a desirable individual dealing with such matters into a cast-iron system.

An interesting portion of the paper dealt with the traffic control system originally introduced on the railways, and now adapted with a marked measure of success to 'bus operation.

On the railway side, a good knowledge by Underground Railway staff of surface London was desirable, and the possibility of working night trains was discussed. Criticisms and suggestions with regard to non-stop running were included, as well as points in connection with indicator signs and the control of congested station platforms.

The paper was illustrated with a number of lantern slides, and, at the conclusion, was very keenly criticised, the views of the author being opposed by most of the speakers, who included Messrs. W. Nye, London General Omnibus Company Road Superintendent; E. Evans, Chief Clerk, Railway Train Running Section; F. Eggington, Superintendent of 'Bus Time Schedules; and J. B. MacKinnon, Traffic Superintendent, London United Tramways.

Favourite Locomotives

Many Railway Magazine readers may confess to a sentimental attachment—apart from the purely mechanical interest—to a particular railway. The first engines I ever saw, writes Mr. Hewitt, were those of the Great Western Railway (both broad and narrow gauge), but quite a different interest was created by the Adams and Beattie engines of the London and South Western line, particularly the former. I used to see these locomotives at Salisbury, when travelling to Hampshire for my summer holidays, and to this day the London and South Western Railway always appeals to me as a "holiday line." The light green engines—of a brighter shade than the Great Western machines prior to 1894—always pleased me as a boy, and even the Adams "stove-pipe" pattern of chimney—always condemned by modern æsthetic critics—found favour with me. Even now, I enjoy seeing occasionally an Adams 4-4-0 engine working some special traffic over the Great Western line; and actually admire her all the more if she retains her original chimney.

United States Railways in France.

True to the American character for "hustle," the first locomotive for U.S. war service railways in France was completed in 20 working days, and others of this type are now being turned out at the rate of about 30 a day. About 680 of these locomotives and over 9,000 standard gauge freight cars, or goods wagons as they are called in Great Britain, are on order. Narrow gauge equipment for transportation along the battle front has also been arranged, and additional orders for both narrow and standard gauge equipment are likely.

The first order for war locomotives was placed on July 18th, and the first one was completed on August 9th, in spite of the fact that the superheater boiler is constructed specially for this type of locomotive. Otherwise, the locomotives are much similar to locomotives built for the British Government. It is not the most powerful type used in the United States of America, but on a road where the heaviest locomotives would haul a train of about 90 loaded wagons this war locomotive would haul 60 loaded wagons. Like all the equipment it is painted battleship grey and bears the letters "U.S.A." for United States Army.

The box trucks for the U.S. lines in France have about three times the capacity of the standard gauge box wagons used by the French railways until recently. They have the same coupling equipment, etc., as the French rolling stock, so as to be interchangeable with it. The iron railing which runs the length of the vehicle along the top is used to throw a tarpaulin over to protect the contents from the weather. The inside length of the wagon is 36 ft.

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Retirement of the Great Central Railway Secretary.

Mr. Oliver Stanbrooke Holt, after forty years' faithful and valuable service with the Great Central Railway, for twenty-five of which he has filled the position of Secretary, now vacates his office and passes into semi-retirement from the end of the year 1917.

When in 1892 Mr. Holt became the successor to the late Mr. Edward Ross, he automatically took over the secretaryship of the subsidiary lines then in the joint ownership of the Company, the one exception being the Cheshire Lines—an extensive system of railways built up of a number of small lines in Cheshire and Lancashire, of which Mr. Ross had been the Secretary. To

Photo] [*Elliott & Fry, Ltd.*

MR. OLIVER S. HOLT.

Secretary, Great Central Railway, 1892–1917.

this important Committee an independent secretary was appointed. The remaining Joint Lines, to all of which Mr. Ross had also acted as Secretary from their inception, comprised the Cheshire Lines, Liverpool, St. Helens and South Lancashire, Macclesfield, Bollington and Marple, Oldham, Ashton-under-Lyne and Guide Bridge, Sheffield and Midland, Wigan Junction Railways, and the Wrexham and Ellesmere Railway. Since then the Liverpool, St. Helens and South Lancashire, and the Wigan Junction Companies have been dissolved and merged in the Great Central, while the name of the Macclesfield, Bollington and Marple has been changed to the Great Central and North Staffordshire Railway Committee, and the old Sheffield and Midland is now called the Great Central and Midland Joint Committee. In the meantime, too, many other important changes have been made in the constitution of the Great Central Company by the purchase and incorporation therein of neighbouring railways as well as by the creation of additional Joint undertakings.

For example, the North Wales and Liverpool Railway was dissolved in 1904 and became vested in the Great Central Railway. At that time, too, the Wrexham, Mold and Connah's Quay Railway was incorporated with the Great Central Company as from January, 1st 1905, and only a year later the acquisition of the Lancashire, Derbyshire and East Coast Railway took place, involving the transfer of upwards of two millions of capital, while under Mr. Holt's secretaryship the Great Central, Hull and Barnsley and Midland Committee, the Hull and Barnsley and Great Central Railways Joint Committee, the Humber Commercial Railway and Dock Company, the North Lindsey Light Railways, the Seaforth and Sefton Junction Railway, and the Nottingham Joint Station Committee have all since been established.

But the most momentous change with which Mr. Holt has been associated in his secretarial career is undoubtedly the extension of the Great Central system to London, the history of which is so widely known as to render any repetition unnecessary. The formal opening of the New London Extension took place at Marylebone Terminus on March 9th, 1899, an event that will ever remain memorable in the history of the railways of our country. The inaugural ceremony was performed by the Right Hon. C. T. Ritchie, M.P., President of the Board of Trade, who in his admirable address said, in referring to the comparatively unique character of the proceedings :—"There is but little probability of such a scene as this ever occurring again. There is but little probability that any great trunk railway will ever again seek entrance into the Metropolis. There seems but little room for any such enterprise, and the physical difficulties of securing a site in the Metropolis for any great trunk line now is such as to render it most improbable that we should ever again witness a scene like this, commemorating the entrance of any great trunk line into the Metropolis."

The new line had for some nine months previously been opened for mineral traffic ; but it was not until the imposing occasion above referred to that the running of passenger trains between Marylebone and the North was commenced.

The enormous amount of work in all its branches inseparable from the issue of the capital requisite for carrying out so great an enterprise wholly devolved upon Mr. Holt and his assistants. In this connection it is noteworthy that during Mr. Holt's secretaryship he has been responsible for dealing with the issue of additional capital exceeding the vast amount of thirty-three millions, and by the large accession of proprietors and debenture holders necessarily accompanying an issue of this magnitude, the work of registration since that period has more than been doubled.

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Although by his retirement Mr. Holt now relinquishes the active control of the secretarial department of the Great Central Railway, he will not entirely sever his connection with the Company, inasmuch as for a period his services in a consultative capacity have been retained by the Directors.

In the catalogue of leading English railway secretaries Mr. Holt, by virtue of length of service, has attained the foremost position, and it is much to be hoped that all the good wishes extended to him on his leave-taking will meet with the fullest realisation.

With the Canadian Railway Troops.

DEALING with the work of the Canadian Troops the following extracts from a dispatch from Major Roland Hill, written at the War Correspondents' Headquarters, France, will be welcomed by many RAILWAY MAGAZINE readers at home and overseas. He remarks :—

"'Somewhere along the front' there is a North American combination constructing, maintaining and operating railways. Many of these men from overseas, Canadian and American worked together in peaceful times on the Michigan Central, the Grand Trunk, and the Pere Marquette. And now that war has thrown them together again in a strange land, they are learning the latest 'stunts' in military railways from their old comrades. The Canadian Colonel —his battalion built this particular section— introduced me to one of the American officers. 'You Canadians got the start of us all right,' said the American, 'but ther's no one I want to get wrinkles from better than Bill here.'

"In one place I found an old Canadian Pacific Railway engineer, driving the little Baldwin he could have almost put in the tool-box of the great transcontinental Mogul of the Imperial, Limited. He had as a temporary pupil one of the drivers of the Pennsylvania, Limited, and on their trips to the forward ammunition dumps it wasn't war they were discussing.

. "In this section of the front Fritz is fairly quiet at the moment, but sometimes he 'strafes' some particular section of the line. . . . The American captain exhorted his men to extra efforts. They were all at it with picks, shovels, and tampers; operators, trainmen and traffic men. 'Keep it up, you fellers,' he shouted. Those boys in the trenches are going to get their rations if we have to take them along in daylight.' It was splendid spirit. 'How much of the line's busted?' asked one of the Canadian officers. ''Bout two hundred yards—up to Blank Junction,' was the answer. 'Then why not shunt your trains back, and take them around to Blank by the "Y" line? You can get through in half an hour.' The American looked at his map. 'Say, boy, you're it. Never thought of that!' he exclaimed gratefully. The rations were waiting at the appointed dumps when daylight broke. That is where the light railway wins."

The Hardinge Bridge over the Lower Ganges at Sara.

A PAPER on this subject by Sir Robert Richard Gales, F.C.H., M.Inst.C.E., was recently read at the institution of Civil Engineers.

The Hardinge Bridge connects the standard 5 ft. 6 in. gauge system of the Eastern Bengal Railway south of the Ganges with the metre-gauge system north of the river. It comprises fifteen girder spans of 345 ft. 1½ in., with three land spans of 75 ft. at each end.

First the paper dealt with the conditions of the site, in the recent delta of a great river. A short description of the delta was given, and attention was drawn to the desirability of the construction of certain railway connections for traffic reasons, and for the purpose of creating a tendency to further stabilisation of the course of the river.

The local choice of site and the design and construction of the training-works considered necessary to render permanent the channel of the river in the immediate vicinity of the bridge were then described, and the particulars given showed that the training-works alone constitute a work of great size.

Considerations on which the main dimensions of the bridge have been based were detailed, and attention was drawn to the very large flood-discharge, which appears to challenge comparison with that of any river yet bridged.

The magnitude of the work, the high and increasing cost of Indian labour, and the importance of rapid completion, indicated the desirability of making greater use of modern plant and special methods of construction than had hitherto been considered economical in India; and the paper described the methods of construction adopted, which, briefly, were the laying-down of electric power-plant and the use of electric power throughout the bridge, the use of cement concrete blocks in the steening of the well foundations, thereby ensuring great weight in the wells and rapidity in building and sinking, and the employment of a temporary service girder of large span for girder-erection in the water spans, thereby ensuring greater certainty and rapidity of construction and a longer working-season than was possible with timber staging under the conditions obtaining.

The rate of construction and details of cost were stated, and showed that the bridge was constructed both rapidly and economically.

A description of the temporary service works and of the medical and sanitary arrangements were included and should make the paper of use to engineers who have large works to carry out in similar conditions of isolation and climate.

Single Line Working.

MR. C. H. PALMER, the contributor of the article on "The Working of Single Lines in Great Britain," that appeared in the RAILWAY MAGAZINE, July, 1917, has written to follow up the remarks of Mr. Robert Baker, Engineer of the British Section of the Kowloon Canton Railway, in the December RAILWAY MAGAZINE,

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concerning single line working in that part of the Far East where he is located.

Mr. Palmer remarks :—" As far as I can gather from the description, the apparatus described is very similar to the looped pouch into which Tyer's tablets are usually placed in England. There would be no reason why the changing should not be done at 40 miles per hour in England, but, as great care is always taken to avoid risk of injury to employees, the practice is not encouraged. On the Midland and South Western Railway the tablet to be surrendered is usually thrown out by the engineman, while the new tablet is received by hand in the usual way. This seems better than *both* dropping and receiving by hand, but I have not seen it done on any other railway ; I suppose that there is a danger that the tablet might break. The London and South Western Railway have, I believe, apparatus, similar to the Great Western Railway apparatus for the staff, for picking up the tablet at speed, *e.g.*, on the Hurstbourne-Fullerton branch, but I have never seen it at work.

" It seems to me that the Whitaker apparatus could be adapted for use with either tablet, staff (if of the new miniature pattern), ticket or ball token. I cannot conceive why it is not more used. It can effect the exchange at any speed and can injure neither signalmen nor enginemen. I have seen it in use on the Somerset and Dorset and Midland and Great Northern Joint Railways, and it is also used on the Highland Railway, I believe."

In conclusion Mr. Palmer expresses the opinion that English railways are particularly backward in this respect, as many do not even have exchange apparatus at all.

Railway Ticket Law.

An Irish reader of the Railway Magazine, who signs himself " J. F.," presents a problem concerning return tickets issued at double single fare. He remarks :—" In cases where a return ticket issued at double the single fare is out of date, what procedure (if any) is taken by the Railway Company against the passenger ? Where tickets were formerly issued at less than the sum of two single fares, the custom was to call upon the passenger to pay up the difference to the sum of two single fares ; but where this has already been done, the passenger cannot well be proceeded against for non-payment of fare, the question of the ticket being out of date being purely a technical one. Personally, I should certainly refuse to pay excess in such a case if demanded. Will any of your readers versed in railway law explain matters ? "

The "Claughtons" and Birmingham, London and North Western Railway.

An answer to a query under above heading in the last issue has given rise to some interesting correspondence. Mr. S. T. T. Gear writes : " The condition under which such locomotives work to Birmingham is that they do not require to be turned there. A Rugby engine almost invariably works the 11 a.m. *ex*-New Street to Crewe, arriving at Birmingham with a 'local' from Rugby. This engine returns to Rugby by the 2.28 p.m. *ex*-Crewe (Irish Mail) *vid* the Trent Valley line. Another regular 'Claughton' working is the 2.50 a.m. from New Street to Crewe : this is a Crewe engine, working up to London with the 6.38 a.m. special stores train, and returning at 10.50 p.m. from Euston to Crewe *vid* Birmingham. At present there are no 'Claughtons' working into Birmingham from the opposite direction. I may remark that these are regular workings, except in so far as circumstances may occasionally demand a different class of locomotive to the 'Claughtons' ". Mr. A. Cocking also writes to the effect that on three consecutive days recently he saw No. 2204, *Sir Herbert Walker*, on a train of empty coaching stock in the sidings between New Street and Vauxhall stations.

Railways and the State.

Mr. Balfour Browne, K.C., who is so well-known in connection with railway cases at the Parliamentary Bar, recently speaking at a meeting of the shareholders of the Trafford Park Estates, Ltd., referred to the railway problem. It had always seemed to him a curious idea that there should be antagonism between the railway companies and their customers, the public, and that it was necessary, in what Parliament calls " its wisdom," to establish a special tribunal, called the Railway and Canal Commission, to prevent railway companies injuring the trade of the country.

Railway transit is a trade, and no trade can be managed except by business men, and it is a ludicrous idea that a Court of Law can manage the business of the railways of England. At the present time we know that the railways are in the hands of the State, and we know that a Special Committee has been appointed by the President of the Board of Trade to consider the whole question of the future of railways. There are thirteen million pounds invested in our railways, and some of it not wisely. There are about one million people who hold stocks in them, and are, therefore, interested in the dividends. It is obvious that the working expenses and labour bill of railway companies must be enormously increased, and that will lead to an increase, and not a decrease, of railway rates for merchandise, to the detriment of the trade of the country, already suffering from rates higher than those charged on Continental railways, if the old system is to continue.

He was not in favour of the railways being taken over by the State. He thought the State would work them badly, and that they might be used for political instead of for trade purposes ; but something drastic must be done. He did not like the idea of subsidising the companies, for that can only be done by putting the hand of the State into the pocket of the taxpayer. The roads of the country are administered by public bodies ; why not the iron roads ? Why should not the State purchase the railroads from the companies and lease them to the companies to work ? By

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that means the Government could put, by Covenant, stringent and drastic conditions on the companies in favour of trade, and so regulate railways in the public interest without the cumbrous, expensive and foolish machinery of a Court of Law. That, too, would place a large amount of capital in the hands of the companies, and he thought it would bring about a unity of working these continuous roads, which is as essential as the unity which the Prime Minister has been insisting on with the Allies. In that way the railways would be gainers and the traders protected. With fair play, the traders of this country can hold their own against the industrial armies of the world.

Some Curiosities of Railway Station Names.

FOLLOWING Mr. Hopwood's article in the December RAILWAY MAGAZINE, Mr. D. V. Levien contributes the following:—

Further study of the pages of Bradshaw and the Railway Clearing House Handbook of Railway Stations reveals some unusual station names which we might ordinarily have expected to find in the Continental edition of Bradshaw rather than in the United Kingdom issue.

For instance, if we were asked to arrange a journey from Alexandria to Joppa and Canaan *viâ* Desert, we might well be excused if our first thoughts suggested a trip from Egypt to the Holy Land. The facts are, however, that there is an Alexandria in Dumbartonshire, and a Joppa—suburb of Edinburgh—both on the North British Railway, while Canaan is a colliery station on the Llanelly and Mynydd Mawr line, Carmarthenshire, and Desert (Ireland) on the Cork, Bandon and South Coast Railway.

We might also perhaps be somewhat sceptical if we were told that we could get all the way from Canada to Friockheim and Skelbo by train—as the names are somewhat suggestive of a steamer trip in Scandinavian waters. We should, however, merely go north from Liverpool Docks (London and North Western)—Canada being the name of one of them—getting at Carlisle on to the Caledonian line and continue thereon to Friockheim in Forfarshire, thence on to the Highland Railway *viâ* Perth and Inverness, where we shall find Skelbo in Sutherlandshire situate between The Mound and Dornoch. Neither must we be disappointed if in a round trip from Balerno to Bellarena, Bellaggio and Valentia we fail to find perpetual sunshine, lemon groves and swarthy complexions—bearing in mind that they are respectively places on the Caledonian, Northern Counties Committee (Midland), London, Brighton and South Coast, and Great Southern and Western Railways.

It is probable also that there are no through bookings between Aspatria, Etruria and Herculaneum at the present time, but the journey can quite easily be accomplished in a day without submarine risk, seeing that the first mentioned is on the Maryport and Carlisle Railway, the second on the North Staffordshire line and the last named one of the Liverpool Docks.

If we travelled from Vobster Quarry through to Brunswick, Spa, Poyntzpass and Muntz's Sidings, we could not rightly be accused of trespassing on enemy soil, as their situation respectively is on the lines of the following Companies:—Great Western, Cheshire Lines Committee, Great Southern and Western, Great Northern (Ireland) and London and North Western; but to get to Hell we should have to go beyond the confines of Great Britain, as a station of that name may be found on the Norwegian Railways.

Many Londoners will be surprised to learn that it is not necessary to remain in the Metropolis to get from Charing Cross to Waterloo *viâ* Strand, as the North British line boasts a Charing Cross station—the Great North of Scotland, the Caledonian, as well as the London and North Western a Waterloo—while Strand is the joint property of the Great Western, London and North Western, Midland, Rhondda and Swansea Bay and Swansea and Mumbles Railways.

Names such as Beer (London and South Western), Bury (Lancashire and Yorkshire), Idle (Great Northern), Deadwater (North British), Hicbibi (London and North Western), Mumps (Lancashire and Yorkshire), O-magh (Great Northern, Ireland), Papcastle (Maryport and Carlisle), and Toome (Northern Counties Committee) offer opportunities somewhat beyond the scope of these notes, but it would not be difficult to arrange them connectedly so as to reveal a sinister tragedy.

While the youth who, at a railway entrance examination, answered "Wall's sausages" when asked for what Cambridge was famous, may well be excused—it would be difficult for anyone to be ignorant of the fact that Cwmyfiog Brithdir (Brecon and Merthyr), Llanfaircaereinion (Cam), and Pontryhydyrun (Great Western) are really Welsh stations.

Porters' Tips are "Earnings."

IT has been decided by the House of Lords that the "tips" a railway porter receives must be included in his "earnings" in considering the amount to which he is entitled in a claim under the Workmen's Compensation Act, 1906. This being so, it follows that Government official and Trade Union statements of railway porters' earnings should also include this item, which would make a substantial difference in the appearance of the figures. In giving judgment in the case of the Great Western Railway *v.* Helps, Lord Dunedin said: The respondent was injured in the course of his employment by an accident arising out of his employment, and it was not denied that he was entitled to compensation, but the controversy between the parties was whether in estimating this compensation there was to be taken into account such sum as represented his average takings in tips. The whole point was: Did these tips fall within the statutory meaning of "average weekly earnings?" Of course, if anyone were asked what this porter earned he would reply that he got so much from his employers and so much from tips. It was

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contended that earnings must be confined to what he got by direct contract from his employers. The simple answer was that the statute did not say so. It used the general term "earnings" instead of the term "wages" or the expression "what he gets from his employer." Owing to this system of tips the employers obviously got the man for rather less wages than they otherwise would. More than that, the employers were privy to the practice. The arbitrator found as a fact that this system was sanctioned by the employers. That finding could be challenged on two grounds only—that it proceeded on some error in law or that there was no evidence to support it, and there was no suggestion of that kind here. The result was that these tips were part of the man's ordinary earnings. The appeal failed.

A Railway Poet.

THERE has just been published in London by Mr. John Lane a half-crown volume, entitled "The Day and other Poems," by Henry Chappell, with an introduction by Sir Herbert Warren, K.C.V.O., D.C.L. Many RAILWAY MAGAZINE readers doubtless made acquaintance in the early days of the war with "The Day," the poem which gives the title to this little volume. It was the work of Mr. Henry Chappell, a Great Western Railway porter at Bath, and it first appeared in the *Daily Express*, but being reprinted obtained a world-wide circulation in leaflet form.

As mentioned in the introduction by Sir Herbert Warren, Mr. Chappell was born in London in 1871, at 12, Bathurst Street, Sussex Square, where his father had a shop. But his family were Cornish, of the yeomanry class and came from St. Just, and directly he joined the service of the Great Western Railway in 1891 he was sent to the West. His work lay successively at Bath, Chippenham and Clifton, and he began to send pieces to the Bristol and Bath papers.

The earliest poem of his to attract attention was "The Record Run to the West," the occasion of which was the sending of a Royal express train from London to Plymouth, for the first time without a stop.

The following verses, entitled "The Coal Strike," form a fair sample of the quality of Mr. Chappell's muse :—

"Red are the rails with rust to-day,
Red is each standing wheel ;
No cheerful clank from the gleaming crank,
Or the kiss of steel on steel.
No whistle shrill awakes the hill
To fling an echo back,
Nor piercing beam of a signal's gleam
To give, or bar the track.

Red are the parents' hearts to-day
As they watch the spectre creep,
Gaunt skin and bone, while the children moan
In their hungry, troubled sleep.
No hope is born with the breaking morn,
No work—no fire—no food ;
Another day must be starved away
And wept in tears of blood.

White is a little childish form,
White in the arms of Death ;
And O, so thin, that thro' the skin
The sharp bones show beneath.
A tiny mound in the churchyard ground,
Apart from the marbles carved ;
And never a scroll for the little soul,
Who went to Heaven starved."

Photographic Survey of a Proposed Railway Route.

IN pre-war days the camera was much used by British railways as a means of securing publicity for the attractions of the holiday resorts served by them, but in America another railway use has been found for the photographic art. A panoramic photographic survey of the proposed Oregon, California and Eastern Railway's route has been made to show the character and possibilities of the country to persons interested. The camera used was capable of making a picture 8 in. wide and up to 4 ft. long. It revolved on the head of the tripod and was driven by clockwork, so as to cover any desired degree of a circle. From a high point it was possible to cover a distance of 10 to 30 miles. In most cases it was found practicable to take a view from one valley to another, the points being selected by the engineer. Each picture was begun at about the point where the previous one ended.

It required 31 pictures, each 3 to 4 ft. long to cover the entire route. This work consumed 19 days, as much time was taken in getting to and from the view-points. Pictures were taken only under favourable conditions of light, atmosphere and absence of wind, in order to get good results. After the photographs had been made, the Chief Engineer had a draughtsman plot the line of the survey upon each picture, so as to show the cuts, fills, structures and other main features.

Work on an Ambulance Train.

A SYMPATHETIC account of the life and work on an ambulance train, which appeared in the handsome Christmas Number of the *Windsor Magazine*, contained some interesting details of actual experience. In the course of his theme the writer remarked:—

"The train concerning which this article is written left the railway works, completed for use, in the early days of the War, in the remarkable time of nineteen days after the receipt of the Government order, and it has been running until the present time, with the exception of a short rest when an overhaul was considered necessary. Forty thousand miles is considered a fair run without any severe testing being applied to the wheels and to the springs of the coaches. The average mileage attained per month is probably about five thousand. The number of

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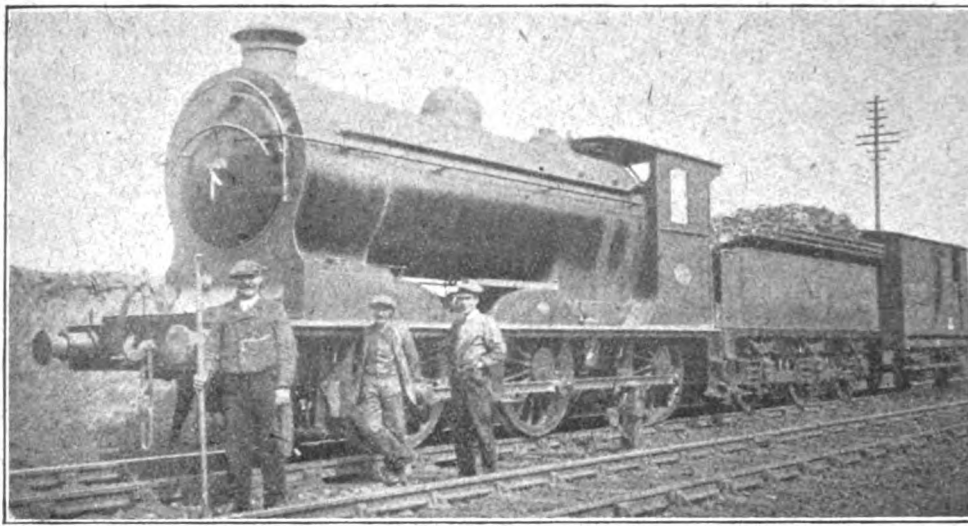

Photo] [*Frank Bell.*

NORTH BRITISH RAILWAY.

0–6–0 Superheater goods engine, No. 44, at Westcraigs.]

journeys undertaken in the same period of time has varied considerably, naturally depending on the percentage of sick and wounded conveyed to England. As a rule, this train has been on the road some portion of each day. The train consists normally of ten coaches. For extra accommodation for patients who are able to walk, ordinary corridor carriages are frequently added, and vestibule railway vans are utilised for additional cot cases.

"The first coach contains quarters for the medical officer and for the nurses. The second coach accommodates the kitchen and the quarters for the orderlies. Seven coaches provide space for patients, one of these being the pharmacy car, where all 'walking cases' are treated when necessary. This car is fully equipped with medicines, surgical instruments, and dressings, and it contains a good bathroom available for the resident staff, and an office for clerical purposes. Here all necessary documents are typed.

"As regards the construction of the train, when two additional coaches are attached—which is often the case—a walk from one end of the train and back again means a distance of over four hundred yards—nearly a quarter of a mile. Telephonic communication exists from the officers' bathroom to the coach at the further extremity. Electricity for lighting purposes is manufactured by means of dynamos attached to the floors, and it is stored in accumulators."

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THE directors of the Great Central Railway have appointed as Secretary in succession to Mr. Holt, retired, Mr. James A. Campbell, who for the last two-and-a-half years has acted as Mr. Holt's assistant in the Secretary's department. Mr. Campbell was born at Eastbourne in May, 1873, and is the son of Major General James Campbell, R.A. He commenced his business career in a foreign merchant's office in London, was for some little time in the Great Western Railway service at Paddington, leaving there at the end of 1892 to go to the London office of the Taltal Railway Co., Ltd., of which he became Chief Clerk, at the same time holding the position of Secretary of the Vulcan Foundry Co., Ltd. He left this position in May, 1899, to take up the office of Chief Clerk and Accountant in London of the Cuban Central Railways, Ltd., upon that company's formation, and became Secretary of the Cuban Central Railways in 1908, a position which he held until December, 1913, when the lines came under the control of the United Railways of Havana, Ltd., having therefore been with the company from the day the prospectus was issued until the day the control passed to the United Railways. In February, 1914, he was appointed Secretary of the People's Trust Co., Ltd., and in July, 1915, joined the staff of the Great Central Railway as personal assistant to the Secretary. Mr. Campbell is a Fellow of the Chartered Institute of Secretaries; and a Freeman of the City of London.

* * *

A RECENT supplement to the *London Gazette* announced that Mr. Charles Hubert Stemp, Operating Superintendent, North British Railway, had been appointed a Major in the Royal Engineers and Railway Staff Corps. Major Stemp is a Cambridge man by birth, and began his railway career on the Great Eastern Railway. His portrait and biography appeared in the RAILWAY MAGAZINE, March, 1917.

* * *

WE regret to record the death of Lieutenant-Colonel Charles Sherwood Denniss, J.P., of Dinas Powis, Cardiff, late of the Engineer and Railway Staff Corps, and formerly General Manager of the Cardiff Railway and Bute Docks, at the age of 57. Colonel Denniss was the son of the late Mr. Henry Denniss, who was Goods Superintendent on the North Eastern Railway. His early railway experience was gained in the office of his father, which he entered upon leaving the East Riding College, Hull, his service with the North Eastern Railway dating from 1875. He spent 18 years with the North Eastern and Great Western Railways, serving the latter at Shrewsbury and Reading. In 1892 he rejoined the North Eastern Company, and was appointed Superintendent of the Central Division at Darlington, becoming also Assistant Docks and Goods Manager at Hull. Three years later he became General Manager of the Cambrian Railways at Oswestry, a position held for 15 years, during which there was a great deal of progress made in the development of the undertaking. From that position Colonel Denniss was, at the beginning of 1910, appointed General Manager of the Cardiff Railway, owners of the Cardiff (Bute) Docks, a position which he held

THE LATE MR. E. H. TURNER,

Superintendent, Nine Elms Goods Department.
Mr. Turner's obituary notice appeared in the December, 1917, RAILWAY MAGAZINE.

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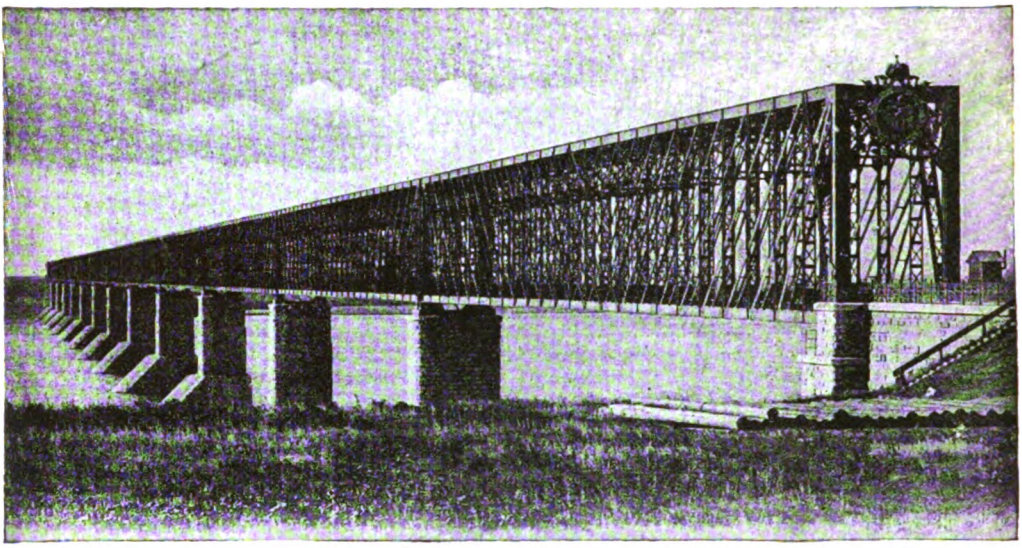

THE ALEXANDROVSKY BRIDGE OVER THE VOLGA.

This illustration is reproduced from *Russia*, a journal of Anglo-Russian trade, by the courtesy of the publishers, Messrs. R. Martens & Co., Ltd., 149, Leadenhall Street, London, E.C.3.

until his retirement, when he was succeeded by Mr. E. A. Prosser, of Llanishen, who is now acting as Joint General -Manager to the three local railway undertakings—the Cardiff Railway, the Taff Vale Railway, and the Rhymney Railway. During his term of office at Cardiff Colonel Denniss maintained the friendliest relations with all interested in the trade at the docks. In recent years he had taken a prominent part in the public life of the district. He was a Lieutenant-Colonel for many years of the Engineer and Railway Staff Corps, a lay member and preacher of the Wesleyan Connexion, and a director of the Wesleyan Methodist Trust Assurance Company. During the last royal visit to Cardiff he was warmly thanked for the excellent arrangements he made for the reception of the King and Queen at the Docks. Lieutenant-Colonel Denniss was a keen supporter of the RAILWAY MAGAZINE and only a week or two before his death he was in communication with the management.

* * *

WE regret to record the death in action of Capt. Eric Seymour Molyneux at the early age of 25 years of age. He was educated at Malden College and subsequently at the City of London School. He was in the O.T. Corps at the latter institution. He joined the Artist Rifles on August 5th, 1914, as he felt his country had need of his services, and, therefore, with six other Surbiton friends, offered his services. He was a good sportsman, footballer, swimmer and riverman, being an expert puntsman. A week after he joined the Artist Rifles he volunteered for the Active Service Battalion, and left for France in October, 1914. He fought in the first battle of Ypres and, with the exception of a few intervals of leave, has been most of the intervening three years at the front. He was gazetted from the Artists to the 1st Worcestershires, and was attached to the 3rd Corps, Cyclist Battalion, when he met his death in the recent fighting at Cambrai. Writing to his father, his Commander said that he was fighting with the greatest gallantry when he met his death. He was the younger son of Mr. Thos. F. Molyneux, Superintendent of the London District of the London and South Western Railway, whose elder son is now serving in France, where he already has distinguished himself.

* * *

MR. DAVID COOPER, General Manager, Glasgow and South Western Railway, was presented by the Glasgow and South Western Railway Ramblers' Association (Chief Assistants in Head Offices, principal Stationmasters and Agents), in the Board Room, St. Enoch station, on November 27th, with an illuminated address enclosed in a silver casket, to mark his 50 years' service with the Company, during 23 of which he has occupied the position of General Manager. The presentation was made by Mr. John Grierson, Carting Superintendent, he being one of the original members. There was a large attendance of members. The wording of the illuminated address is as follows:—To David Cooper, Esquire, General Manager of the Glasgow and South Western Railway. Sir,—We the undersigned members of the Glasgow and South Western Railway Ramblers' Association (Chief Assistants in Head Offices and Principal Stationmasters and Agents) desire to convey to you our sincere congratulations on the completion of 50 years service with the Company during 23 of which you have occupied the position of General Manager, with credit to yourself, to the Directors and Shareholders of the Company, and with

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satisfaction to the public in general. It is our desire to recognise this splendid attainment by placing on record our sense of appreciation of the sterling qualities of character conspicuous in your career. To manage successfully and please universally is the gift of few, yet it may be truly said that you have combined these qualities with singular felicity, and while assiduous in your labours to promote the best interests of the Company you have ever sedulously striven to preserve the goodwill and respect of all who served under you, with what success this parchment bears witness. We have pleasure in rendering this tribute to you in testimony of our homage.

* * *

AT an ordinary meeting of the Lambeth Borough Council, Mr. Councillor Jonh C. Mitchell, F.C.I.S., was appointed as the Council's representative on the Metropolitan Water Board. Councillor Mitchell is Treasurer of the Underground Electric Railways Company of London, Ltd., and Allied Companies, and has recently served as President of the Chartered Institute of Secretaries.

* * *

MR. SAMUEL J. HUNGERFORD, who for the past seven years has occupied the position of Superintendent of Rolling Stock to the Canadian Northern Railway, has been appointed General Manager of the company's eastern lines in succession to Mr. L. C. Fritch, resigned. In the Canadian railway world, Mr. Hungerford is a well-known figure. Born near Bedford, Quebec, in 1872, he entered the service of the Canadian Pacific Railway as a machinist's apprentice. Later he became locomotive foreman at Megantic, Quebec, and subsequently he was made Superintendent of the Locomotive Shops at Winnipeg, and in 1908, Superintendent of Shops, a position he retained until March, 1910, when he became associated with the Canadian Northern Railway, at Winnipeg.

* * *

IT is announced that Mr. Joseph Shaw, K.C., of Kentchurch Court, Hereford, chairman of the Powell Duffryn Steam Coal Company, has been appointed a director of the Great Western Railway to fill the vacancy caused by the retirement of Mr. Stanley Baldwin, M.P., on his appointment as a Junior Lord of the Treasury.

* * *

LIKE the heavy railways, tramways and light railways have their brake problems. Some years ago Col. Yorke, R.E., of the Board of Trade, made some trenchant criticisms in a report issued on a run-away accident at Highgate regarding the methods of braking in use on most tramways. As an immediate result special Committees of both the Tramways and Light Railways Associations were formed to consider the question of brakes generally, and both Committees agreed that better brake equipments were needed. To meet the suggestions, Mr. C. J. Spencer and Mr. J. W. Dawson, who are respectively General Manager and Engineer to the Bradford City Tramways, have produced a brake which it is claimed meets the Committee's suggestion for an ideal equipment. An excellently illustrated catalogue giving a full description of the Spencer-Dawson brake has been issued by Messrs. Cole, Marchant and Morley, Ltd., Engineers, Bradford.

* * *

No small interest was aroused among London readers of the RAILWAY MAGAZINE by the problem on page 431 of the December number whereby a cabman was required to drive from

THE "MIKADO" COMPANY OF THE OPERATIC SECTION OF THE LONDON & NORTH WESTERN RAILWAY (LONDON) ATHLETIC ASSOCIATION.

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Grosvenor Road, Pimlico, to the old Canterbury Music Hall in Westminster Bridge Road without passing under a railway bridge. Mr. F. H. Stingemore has set out the following as the shortest and most expeditious route for such an adventure :—

Starting from Grosvenor Road, Pimlico :
Westmoreland Street,
Sutherland Street,
Over Ebury Bridge,
Pimlico Road,
Lower Sloane Street,
Sloane Square,
King's Road, Chelsea,
Harwood Road,
Walham Green,
Fulham Road,
High Street, Fulham,
Across Putney Bridge,
High Street, Putney,
Putney Hill,
Lytton Grove,
West Hill,
High Street, Wandsworth,
East Hill,
St. John's Hill,
Lavender Hill,
Wandsworth Road,
Brayburne Road,
Larkhall Rise,
Larkhall Lane,
Lansdowne Road,
Clapham Road,
Kennington Park Road,
Kennington Road,
Westminster Bridge Road, to
"Canterbury" Music Hall.

Mr. Stingemore asks if any other RAILWAY MAGAZINE reader can find a shorter way round that complies with the conditions of the problem.

* * *

BY an inadvertence the early North Eastern Railway 4-4-0 engine No. 576, illustrated on page 431 of the last issue, was described as a "Tennant" locomotive. Several readers have written to remark that the engine concerned belongs to Class "38," and was designed by Mr. McDonnell during his short tenure of the North Eastern Railway locomotive "chieftainship" in 1884. These matters were dealt with so recently by Mr. E. L. Ahrons in his "Locomotive Working" series that there is no need to recapitulate them. Mr. T. F. Young, in a letter, points out that the cab side sheets of this particular engine have been altered from their original form in order to afford better protection to the enginemen, and adds : "All Mr. McDonnell's engines were fitted to drive from the left-hand side, but were gradually altered to drive from the opposite side. I believe that only one McDonnell engine remains, driving from the left-hand side—a 0-6-0 type goods engine."

* * *

NOWADAYS locomotives far from their parent line are frequently seen. Mr. J. B. Sherlock, Treasurer to the Railway Club, writes to say he recently observed a Glasgow and South Western Railway 0-6-0 goods engine on a train at West Ealing, Great Western Railway. Mr. Sherlock was travelling in the 1.0 p.m. down train from Paddington.

* * *

A RAILWAY MAGAZINE reader, who signs himself "A Brighton Admirer," writes :—"On page 433 of the December number it states that Messrs. Hewitt and Dorey are in agreement to the effect that the pioneer 4-4-0 locomotive on the Brighton line was the late Mr. R. J. Billinton's No. 314, the original *Charles Macrae*. May I point out that Mr. J. C. Craven, in 1859, built an experimental locomotive of the 4-4-0 type ; the locomotive had outside cylinders, 4-coupled wheels, a leading bogie, and was fitted with a saddle tank. This engine ran for many years. I remember seeing it at Lewes in my boyhood days. It was about 1872 when I went to school in Sussex for several years, and got to know a great many of the engines produced in Mr. Craven's time and the earlier part of the Stroudley regimé. From my observations the coast line services (especially on the Brighton and Portsmouth section), the trains ran at the same times as at present, or, at any rate, with little, if any, difference. The 'singles' of that time were no doubt the prettiest in the kingdom, with the yellow and crimson livery. The 'Horsham and Sandown' classes were slightly better looking with their outside framing, than the 'Solent and Littlehampton' classes, which had inside bearings to the driving wheels, and originally in a great many ways resembled the 'Jenny Linds.' I remember well the single express *Chichester*, the first locomotive fitted with a cab, running on the 10.15 *ex*-Brighton, with side sheets of the cab painted gray. Mr. Craven went in for a number of classes somewhat similar in appearance, but of different dimensions. Another point was very marked on his locomotives : some were fitted with chimneys with brass caps, others with the stove pipe chimneys ; nearly, if not all, of his goods engines were fitted with the latter, being painted a dull olive green. A great number of the goods engines had long fireboxes, there being but little footplate room. They were, however, very powerful engines for their time, and I have seen some long goods trains behind them."

* * *

A RAILWAY MAGAZINE reader, Mr. E. C. Bourne, is wanting among other railway information the three following things :—(1) A list of Midland Railway engine sheds, with numbers. (2) Location and number of any London and North Western Railway engine sheds numbered above 36. (3) The tare weights of Lancashire and Yorkshire Railway ordinary 8-wheeled bogie low-roofed non-corridor coaches and the tare weights of 8-wheeled bogie elliptical-roofed non-corridor coaches. RAILWAY MAGAZINE readers possessing the information are invited to forward it to Mr. Bourne, care of the RAILWAY MAGAZINE office, and the letters will be re-addressed to him. Readers who desire to get

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into touch with others who can exchange information of this kind should join the Railway Club, 92, Victoria Street, London, E.C. The fees, especially for country members, are small, but the advantages of membership are great.

* * *

FROM Eastbourne, Mr. K. Paton writes:—"RAILWAY MAGAZINE readers may like to know that the Crowhurst–Bexhill branch of the South Eastern and Chatham Railway has been to a certain extent re-opened. On Tuesdays and Fridays a motor train, consisting of a 6-wheel third class coach, a bogie saloon and a tender engine, makes two trips both ways between Bexhill and Crowhurst. The morning trip arrives at Bexhill about 10.30 a.m., and departs 10.35 for Battle. In the afternoon it leaves Battle at 5.0 p.m. and arrives at Bexhill at 5.25 p.m., departing again at 5.35 p.m. for Crowhurst. The engine is generallya Stirling 4–4–0, rebuilt with extended smokebox. No. 21 of this class usually takes the morning turn, but the evening trip is worked by an Ashford locomotive. I have seen Nos. 137, 156 and 250 on it."

* * *

SINCE the publication of the May RAILWAY MAGAZINE, in which a list of the sheds of the South Eastern and Chatham Railway 4–4–0 superheaters was given, the following changes have been made: 762 and 766 are now at Tonbridge (5) shed, and 767 is at Hastings (12) shed. No. 775, stated to be at Tonbridge, is back at Bricklayers' Arms (2) shed. Nos. 740 and 743, Wainwright non-Belpaire 4–4–0's, formerly at Hastings, are now at Tonbridge.

* * *

HAVING contributed the two foregoing items of interest for the benefit of RAILWAY MAGAZINE readers, Mr. Paton inquires if anyone of them can tell him under which class letter South Eastern and Chatham locomotives Nos. 760–781 are designated.

* * *

RECENT inquiry in the RAILWAY MAGAZINE concerning the present whereabouts of London and North Western Railway engine, *Thunderer*, has drawn from Mr. F. C. Clark, of Chester, the following informative communication:—"This locomotive, I remember, took the Royal Train from London to Chester and *vice versa* in 1907, when His Majesty the late King Edward VII. visited Chester for the Races. At that time, of course, 'Precursors' had the almost entire express service on the southern main line (Euston to Crewe). That is ten years last May, and, until Monday, August 20th last, I never saw this locomotive again and have not seen her since. On this occasion she was drawing the North Wales express which leaves Chester at 12.30 noon, connecting with the mid-day Irish Mail at Chester and conveying through Liverpool and Manchester carriages. The locomotive of this train, nearly always a non-superheater Precursor, comes with the Liverpool portion (leaving Lime Street station at 11.10 a.m.), picking up the Manchester vehicles at Chester. However, I have never seen a Liverpool (Shed 26) engine on this train, but nearly always a 'Shed 34' (Manchester–Eccles) engine, and rarely, on a Monday as a rule, if at all, a 'Shed 17' (Leeds) locomotive. On this particular occasion the train was travelling too fast for me to catch sight of the shed number of the engine. I am inclined to think she is stationed at Leeds, as 'Eccles' engines rarely work trains in the London Road district, where Mr. J. Turnock says he saw her on a Red Cross train. The train he saw might have come from Leeds or Huddersfield as much as from Manchester. I should also like to draw similarity in numeration and nomenclature between 1120 *Thunderer* and her older sister 1102 *Thunderbolt*, which is at present stationed at Chester. Eccles shed now seems to be a refuge for Precursors as, since September, 1916, I have seen the following locomotives of this type bearing '34': *Cerberus*, *Eleanor*, *Etna*, *Express*, *Ganymede*, *Jason*, *Knowsley*, *Lapwing*, *Mammoth*, *Mersey*, *Simoom* and *Swiftsure*, numbering 12 in all, and, for all I know, there may be more. Unfortunately, there is but little scope for these engines on Manchester–North Wales expresses, of which they practically had the monopoly. Let us hope the services will soon be restored and Llandudno will again become a two-hours' journey from the 'Cottonopolis!'"

* * *

AN electric locomotive has recently been built at the South Manchuria Railway works at Shakako for the use of the Fushun mines, and the construction of seven others of a similar character was proposed by the middle of this month. It is understood that this is the first attempt to build this kind of locomotive in Manchuria, supplies having been obtained hitherto from Germany or the United States of America. A copy of the specification of the locomotive has been forwarded by H.M. Consul at Dairen to the Department of Commercial Intelligence, where British firms interested may consult it.

* * *

IN reply to a request by the Beddington and Wallington Urban Council that the London, Brighton and South Coast Railway should receive a deputation to discuss the increase in the rates of season tickets, the general manager, Sir William Forbes, wrote:—I would point out that season tickets are issued by railway companies only as an act of grace, and that, owing unfortunately to the many cases of abuse in regard to the user of season tickets, it is quite possible they may before long be obliged to adopt the principle of daily fares only.

* * *

FROM Cambridge, Mr. T. C. Adkins writes:—"It may interest some of the readers of the RAILWAY MAGAZINE to know that a 0–6–0 tank engine carrying the name *Easingwold* on her tanks is at present working on some coprolite excavations near Granchester, Cambridgeshire. This line joins the London and North Western Railway between Cambridge and Lord's Bridge. The locomotive is painted green, and is controlled by hand brakes. I conclude that this engine is the one mentioned by Mr. Potter

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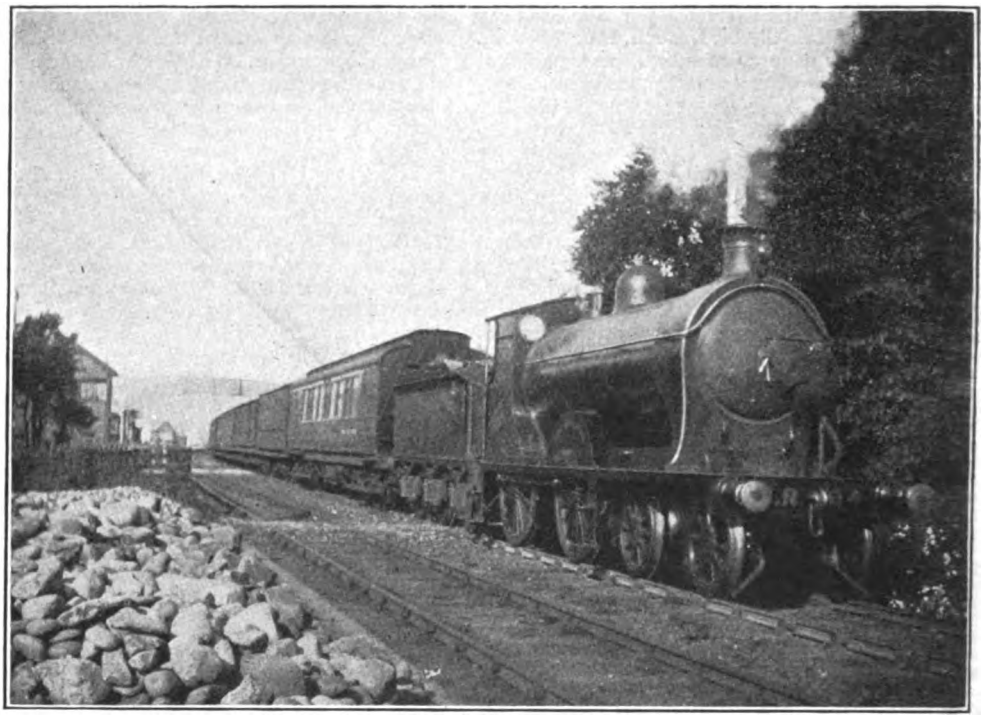

Photo] [*Tom M. L. Neish.*

HIGHLAND RAILWAY.
Mail train Perth to Inverness re-starting from Kingussie.
4–4–0 locomotive, "Big Ben" class, No. 64, *Ben Mholach.*

in the December RAILWAY MAGAZINE as being the original locomotive of the Easingwold Railway, which was sold in 1903 to a private firm."

* * * *

A MEETING of the Secretaries of Railway Societies was held in the Norfolk Hotel, London, on December 6th, 1917. The societies represented were as follows :—Great Western Railway Staff Friendly Society, Great Eastern Railway Society, Caledonian Railway Servants' Friendly Society, London and South Western Railway Friendly Society, London and South Western Railway New Friendly Society, S. & E. Railway Pension Fund, London and North Western Railway Pension Society, Lancashire and Yorkshire Railway Superannuation Fund, London, Brighton and South Coast Railway Pension Fund, North Eastern Railway Servants' Pension Society. Mr. G. Fletcher, of the Great Western Railway Friendly Society, presided, and after a very interesting discussion on matters relating to railway societies, it was resolved "That a Conference of Secretaries of Railway Societies be established to meet periodically and discuss matters of common interest." Mr. J. Longstaff Dennison, of the North Eastern Railway Servants' Pension Society, was unanimously elected secretary. A further meeting will be held in due course, when it is anticipated that the whole of the secretaries of railway societies will be present. Full particulars may be had on application to the Secretary.

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THE RAILWAY MAGAZINE.

GREAT WESTERN RAILWAY, 4-6-0 "Star" Class, locomotive No. 4041,
Prince of Wales.

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RED HILL JUNCTION.
South Eastern and Chatham and London, Brighton and South Coast Railways looking North.

The Reading Branch of the South Eastern and Chatham Railway.

By H. L. HOPWOOD.

A STUDY of the map of the South Eastern and Chatham Railway reveals the fact that, with one exception, the various lines are nearly geographically correct in relation to the title adopted by the amalgamated system, *i.e.*, they radiate from London in a general south-easterly direction and form a network of lines in the county of Kent, and portions of Surrey and Sussex. The exception is the branch to Reading, which leaves the old main line at Red Hill and runs west through Surrey and north-west through Hampshire and Berkshire to Reading, where it terminates.

It is a curious fact that when dealing with the South Eastern and Chatham Railway—historically or otherwise—the generality of writers have given but scant attention to the Reading branch. This may be due to the fact that it is practically isolated from other parts of the system, but whatever the reason, this article is designed to remedy in some degree the omission.

In order to reach Red Hill from London, South Eastern and Chatham trains run over the metals of the London, Brighton and South Coast Railway from Corbett's Lane Junction to near Coulsdon. Thence to Red Hill the line is South Eastern and Chatham property, but the section from Croydon to Red Hill (and south thereof to Brighton) was originally constructed by the London, Brighton and South Coast Railway. By an Act dated 1839 it was provided that, on completion of the works between Croydon and Red Hill, the southern half should be conveyed to the South Eastern Railway at cost price plus interest, and this section—from a point 15 chains on the London side of Coulsdon station to Red Hill—was made over to the South Eastern Railway for the sum of £340,000. The same Act further provided that both Companies' trains might pass over the whole distance from Croydon to Red Hill without payment of toll to each other. It was later agreed that the London, Brighton and South Coast trains should stop at stations on the northern half, and those of the South Eastern Railway at stations on the southern half; Purley station (then called Caterham Junction) on the London, Brighton and South Coast section being used by both Companies as it was the junction for the South Eastern

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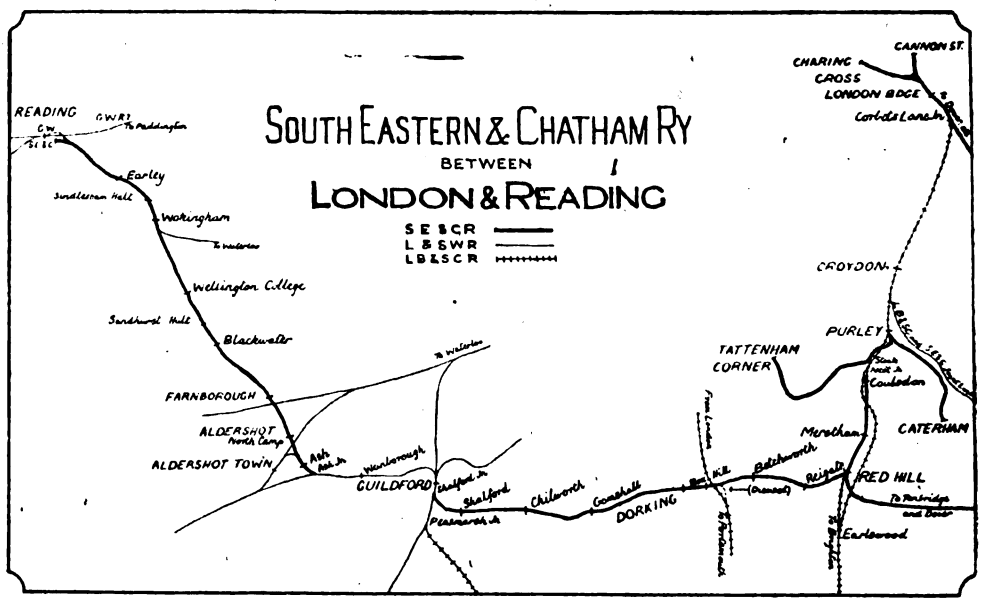
Caterham branch (and later for the Chipstead Valley branch, also, when it was opened in 1902).

Red Hill Junction has lost much of the importance it possessed in its early days. Then known as Redstone Hill, or Reigate Junction, it was situated on the main route to both Dover and Brighton. In 1868 South Eastern trains for Dover were diverted to the present main line *viâ* Sevenoaks, and in 1900 most of the Brighton express trains were transferred to the newly opened Quarry line. The latter extends from Stoat's Nest Junction to Earlswood, passing to the east of Red Hill, and its construction became necessary on account of the extreme congestion of traffic between Croydon and



Red Hill. At the present day the South Eastern and Chatham line to Red Hill may be regarded as a section of secondary importance, serving the Caterham Valley and Chipstead Valley branches; the intermediate stations between Purley and Tonbridge (including Red Hill); and the Reading branch, though cross country traffic east and west of Red Hill is by no means insignificant, and a few really good trains travel from London to Dover, etc., that way, in normal times.

The Reading line was promoted by a separate Company, incorporated in 1847 and known as the Reading, Guildford and Reigate Railway. It was opened in sections during July and August, 1849, and the Company was absorbed by the South Eastern Railway in 1852. The original intention of the promoters was to work the railway on the atmospheric system, but the idea was abandoned before the line was opened for traffic, and locomotives were used from the first.

From Red Hill to Reading the distance is 46¼ miles, but of this total only 39½ miles represent South Eastern and Chatham mileage, the remaining 6¾ miles from Shalford Junction, through Guildford, to Ash Junction, being the property of the London and South Western Railway, and running powers are exercised over this section.

Reading, the county town of Berkshire, is served by three railways. The most direct line from London is that of the Great Western Railway from Paddington, a distance of 36 miles. The London and South Western Railway provides an alternative route of 43½ miles from Waterloo and reaches Reading by means of running powers over 6¾ miles of the South Eastern and Chatham line from Wokingham. The South Eastern and Chatham route is the longest of all, the distance from Charing Cross being 68¾ miles. In view of the great disparity in distance between the three routes, it seems strange that formerly there existed severe competition between the Companies for the Reading traffic. Yet this was the case until 1858, when a three years' agreement was entered

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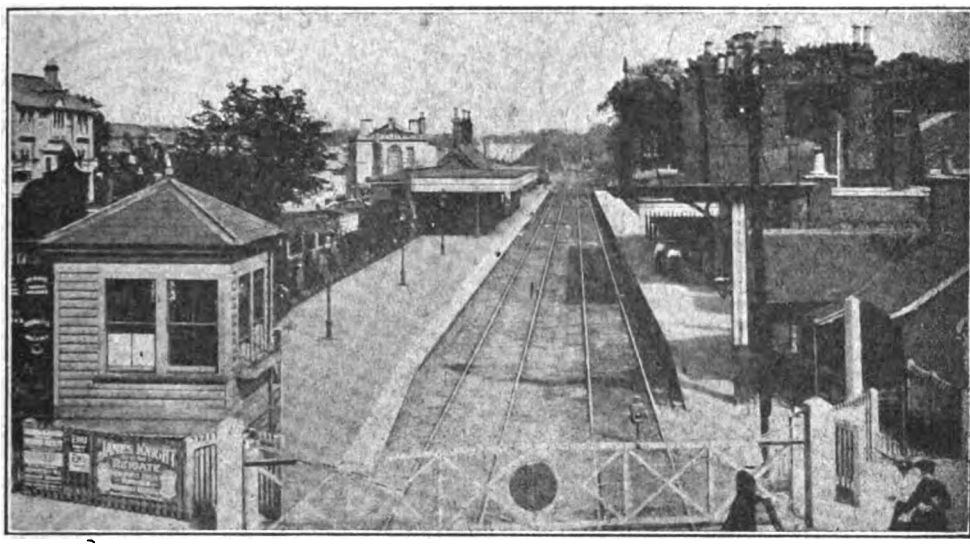
into for the division of traffic. An outcome of this agreement was the construction of the connecting line that exists between the South Eastern and Chatham and Great Western Railways at Reading. This line is owned by the three Companies interested, 3 chains belonging to the South Eastern and Chatham, 13 chains to the Great Western, whilst the intermediate portion of 5 chains is the property of the London and South Western Railway, whose own line from London actually terminates at Wokingham, 6¾ miles from Reading.

To-day, we imagine, none but the most enthusiastic railwayist would deliberately choose to travel from London to Reading by the South Eastern and Chatham Railway; but a journey should be made by those who are sufficiently interested and have plenty of time at their disposal, as the fares are the same by all three routes, charges being of course based on the mileage of the shortest. In the matter of distance from London, much the same thing applies at Guildford as at Reading, the mileage by the London and South Western and South Eastern and Chatham Railways being 30 and 42¾ respectively. It is doubtful whether London passengers would book further than Shalford on the Reading line, as if they desired to travel to South Eastern and Chatham stations west thereof, they would probably go by the London and South Western Railway to Guildford, and there change into the South Eastern and Chatham train. With goods traffic, the case is different, and despite the disadvantage of the longest mileage, we believe the South Eastern and Chatham Railway obtains a very fair share of this traffic as between London, Guildford and Reading.

The Reading branch is important chiefly for its local traffic (which is very considerable), and also traffic exchanged with neighbouring railways at numerous junctions between Red Hill and Reading. It also forms a direct route between Reading and Guildford and towns on its own system such as Tonbridge, Maidstone, Ashford, Folkestone, Dover and Hastings It is not generally realised that from Reading to Dover there is a practically direct run of 113 miles, which distance actually exceeds by 36½ miles the length of the main line from Charing Cross to Dover, *vid* Sevenoaks. All through trains between Reading and Dover must go into Red Hill to reverse, a procedure that might be avoided by the construction, south of Red Hill station, of a short east to west line linking up the Tonbridge and Reading branches.

Various interesting features of the line between London and Reading may now be mentioned. As already stated, at Corbett's Lane Junction, South Eastern and Chatham trains leave their own line (or



REIGATE STATION.
South Eastern and Chatham Railway.

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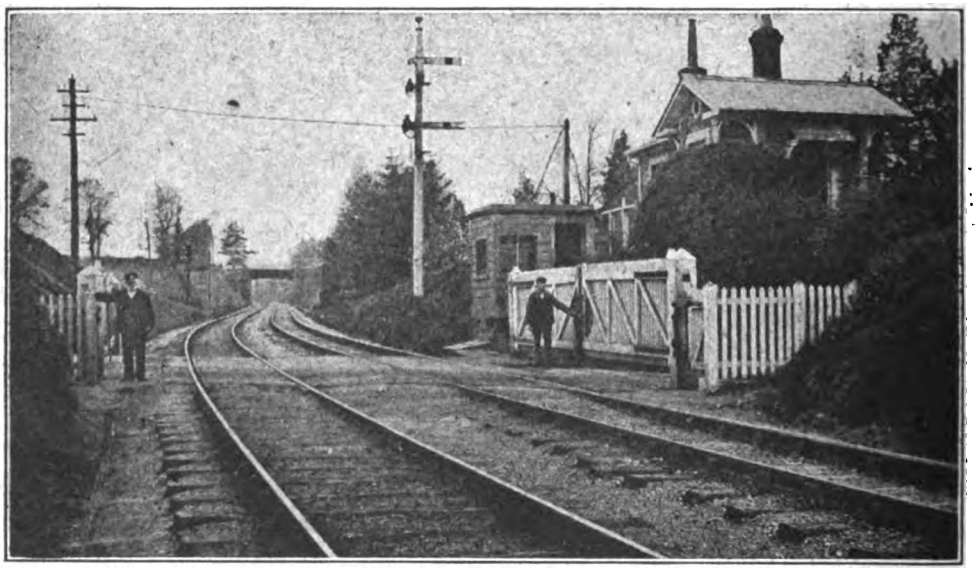
really that of the London and Greenwich, from London Bridge) and travel over London, Brighton and South Coast rails for a considerable distance out of London. There is nothing worthy of note until South Eastern and Chatham territory is again reached just before Coulsdon, but between that station and Merstham the line is carried through a deep cutting and tunnel for practically the whole distance of 3¾ miles. Half way is situated the well known Merstham tunnel, 1 mile 70 yards in length. Next to Merstham is Red Hill Junction, where, south of the station, three lines diverge. The centre one goes to Brighton, that on the left to Tonbridge and Dover, whilst the right-hand line turns west towards Guildford and Reading. Accommodation at Red Hill station consists of two platforms with four roads between them. The up platform is of the island type, the outer face being used by trains from Reading.

The country passed through between Red Hill and Reading is exceedingly fine, the railway for some miles running parallel with the Surrey Downs, and their well wooded slopes unfold many varied and picturesque scenes, which amply compensate for the long time spent on the journey. Reigate is the first station from Red Hill, and the two towns are practically joined. On approaching Box Hill station the main Portsmouth line of the London, Brighton and South Coast Railway is crossed, and on the left-hand side is a derelict piece of railway that formerly joined the two systems, the rails still being in place to within a few yards of the South Eastern and Chatham line. Box Hill and Dorking are favourite resorts of Londoners, the principal attractions of the district being Box Hill to the north of the railway, and Leith Hill (the highest part of which is 965 ft. above sea level), a few miles south.

At Shalford Junction, 19¼ miles from Red Hill, we pass on to the London and South Western Portsmouth line, and running through two tunnels, soon enter Guildford station, an important traffic centre; no fewer than five routes converging here.



LEVEL CROSSING, GOMSHALL.

Proceeding on the journey, a run of 5½ miles brings us to Ash Junction, where South Eastern and Chatham property is again entered upon. Next is Ash station, near to which point there is a junction with the London and South Western line to Aldershot. Between Ash and Aldershot Town station (2¾ miles) the South Eastern and Chatham Railway work a shuttle train, this being accommodated at a bay line on the up side at Ash station. Passing Aldershot (North Camp), and running under the London and South Western main line just before Farnborough, the next station of importance is Wokingham Junction, where the London and South Western route from

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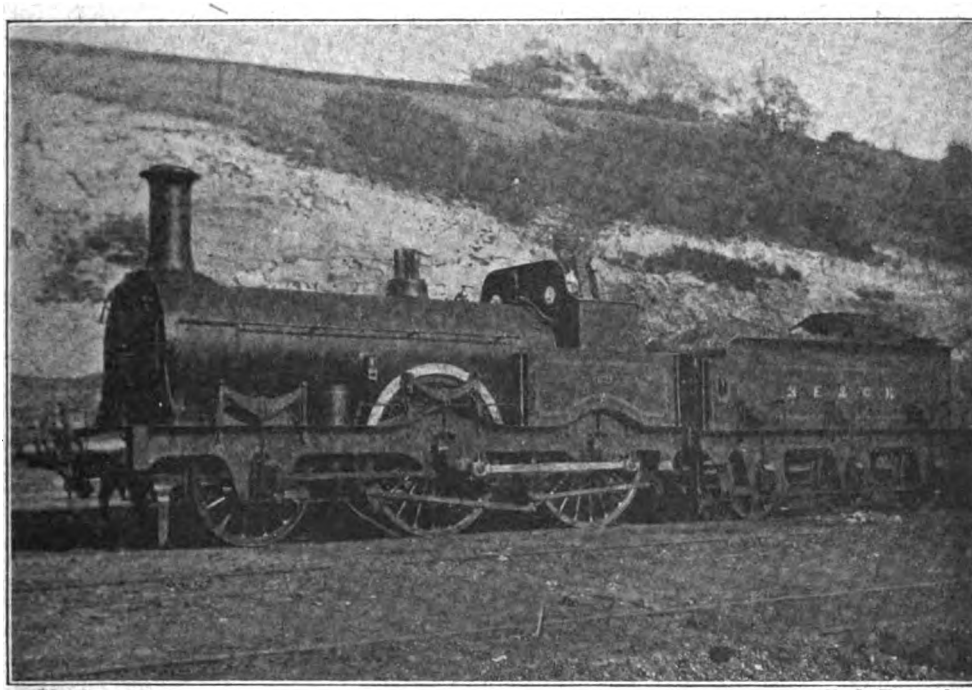
London to Reading joins the South Eastern and Chatham Railway. Half-a-mile before Reading passenger station is reached, the three Companies' connecting line to the Great Western system, previously alluded to, is seen on the right-hand side. This runs under the Great Western main line and connects with it on the up side.

There is an extensive goods yard at Reading, and also a connection to Messrs. Huntley and Palmer's private sidings.

The South Eastern and Chatham passenger station is a fairly modern building, comprising two island platforms and four roads,

Between	Gradient of 1 in
Red Hill and Reigate	100 up
	154 down
Reigate and Betchworth	141 down
	196 up
	150 up
Betchworth and Box Hill	150 down
	125 down
	100 up
Box Hill and Dorking	130 up
Dorking and Gomshall	96 up
	96 down
Gomshall and Chilworth	96 down
	100 up
	96 down
	100 down



Photo] [H. L. Hopwood.

SOUTH EASTERN AND CHATHAM ENGINE, NO. 221A.

Cudworth 4-coupled locomotive, built 1866. Wheels, 6 ft. diameter. Cylinders, 16 by 24 in.

besides siding accommodation. A ground plan of the station was included in an article entitled "Reading as a Railway Centre," which appeared in the RAILWAY MAGAZINE for October, 1913.

The Reading branch is not easily graded, and were it a main line of railway with express traffic thereon, and not merely a branch, the gradients would be reckoned as distinctly hard, there being very little that is easier than 1 in 150. As, however, practically all the trains are slow ones, the gradients do not appreciably affect the running. Grades steeper than 1 in 200 are summarised below :—

Chilworth and Shalford	100 down
	166 down
Guildford and Ash	100 up
	145 up
	121 up
	112 up
	120 down
Ash and Farnborough	150 up
	105 down
Sandhurst Halt and Wellington College	124 up
	150 up
Wellington College and Sindlesham Halt	154 down
	100 down
Earley and Reading	156 up
	156 down
	155 down

In view of the fact that the distance from London to Reading by the South Eastern

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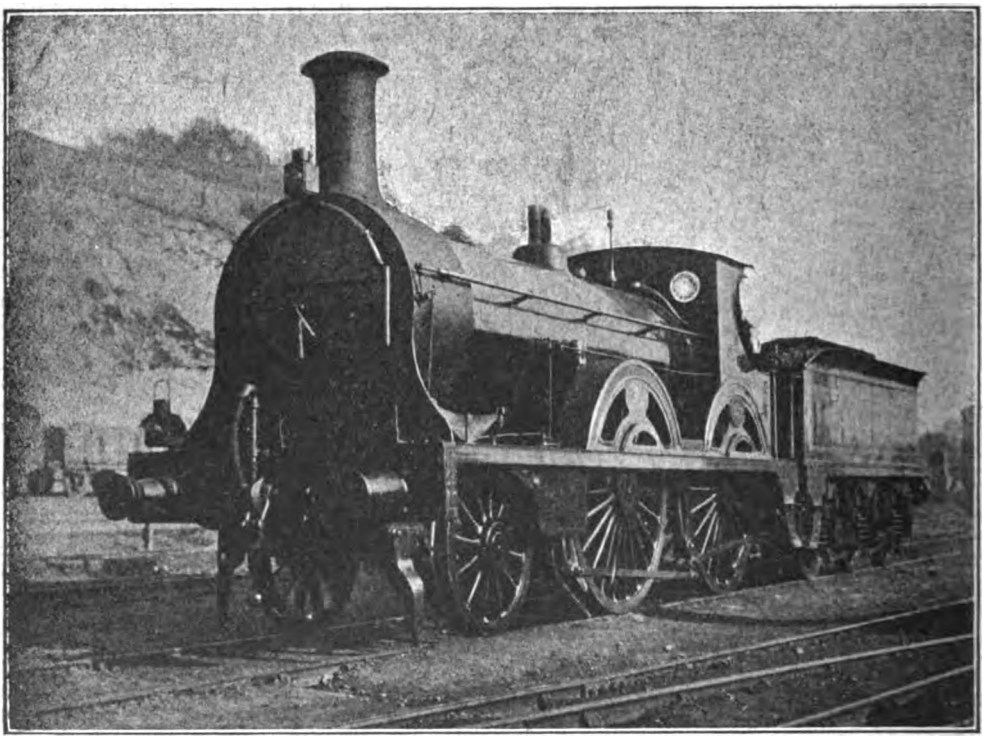
and Chatham Railway is nearly double that by the Great Western Railway, no attempt is made by the former Company to provide a competitive service, and the trains are arranged chiefly to suit the needs of local, rather than through, passengers. It is true that many trains work through from Charing Cross or Cannon Street to Reading, but this is done more for the convenience of working than with the idea of competing with the two other Companies for the traffic, as these trains, by connections, serve also the Caterham Valley and Chipstead Valley stations, stop at Croydon and then all stations from Purley to Reading, the average time occupied on the journey being about 3 hours 10 min. In the summer months before the war, there were a few semi-fast excursion trains between Reading branch stations and seaside resorts such as Margate, Ramsgate, Hastings, etc., and also one fast train each way over the branch which conveyed through coaches between Birkenhead and Deal, and gave connections from and to Great Central stations. In the up direction the train left Birkenhead at 9.5 a.m. and was due Deal



Photo] [*H. L. Hopwood.*

SOUTH EASTERN AND CHATHAM RAILWAY ENGINE, NO. 277.

One of the "Ironclads." Wheels, 6 ft. 6 in. diameter. Cylinders, 17 by 24 in.

as well as those between Red Hill and Tonbridge. Although most of the trains are slow ones, in normal times a frequent service is provided, there being about 12 through trains each way between London and Reading, besides others which run between certain intermediate stations only. A connecting service of South Eastern and Chatham trains is also worked over the London and South Western Railway between Ash and Aldershot Town stations. The London and Reading trains generally

5.55 p.m. In the reverse direction it left Deal at 10.38 a.m. and reached Birkenhead at 9.15 p.m., but in this case the through coach had to wait 70 min. at Reading before the Great Western train took it forward at 3.45 p.m. These trains arrived at and departed from the Great Western station at Reading, which is 5 chains further from Red Hill than is the South Eastern and Chatham station. The timing over the Reading branch was as follows :—

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DOWN.

m. c.				p.m.	Speed. m.p.h.
— —	Red Hill	dep.		1. 9	
7 78	Dorking	arr.		1.22	36·07
	,, ...	dep.		1.24	
20 25	Guildford	arr.		1.45	35·32
	,, ...	dep.		1.49	
28 51	Aldershot, N.C. ..	arr.		2. 2	38·42
	,, ..	dep.		2. 4	
46 25	Reading, G.W. ..	arr.		2.35	34·21

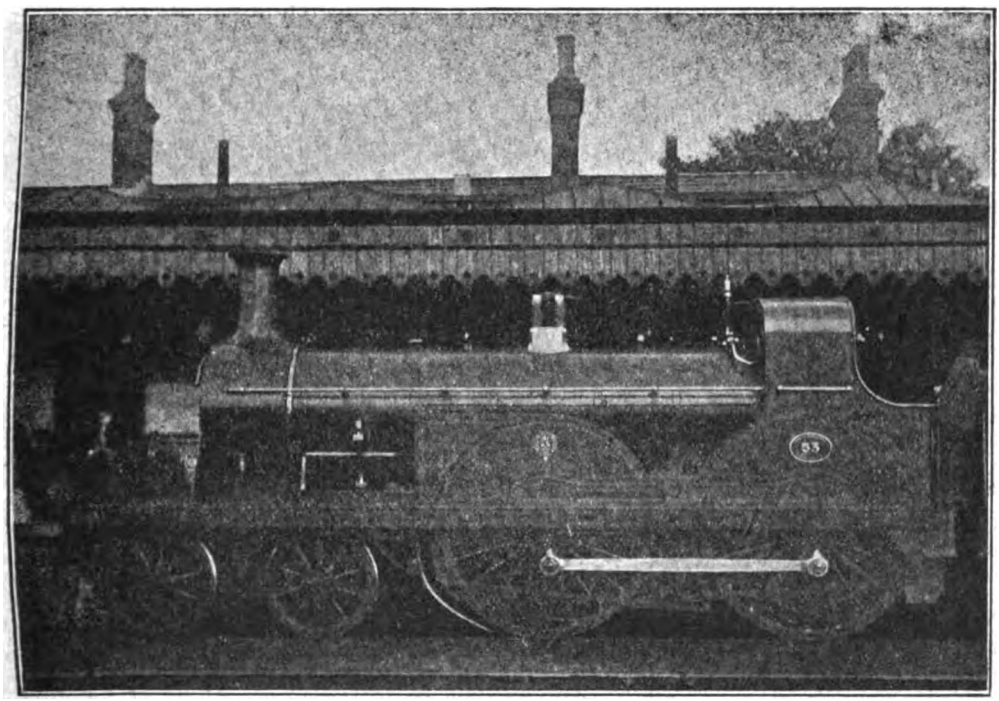
Average speed, excluding stops, 35·62 m.p.h.

UP.

m. c.			p.m.	Speed m.p.h.
— —	Reading, G.W. ..	dep.	3. 5	
17 54	Aldershot, N.C. ..	arr.	3.30	42·42
	,, ..	dep.	3.32	
26 99	Guildford	arr.	3.44	41·62
	,, ...	dep.	3.48	
46 25	Red Hill	arr.	4.18	40·62

Average speed, excluding stops, 41·47 m.p.h.

Among the accompanying illustrations are those of two classes of engines, now obsolete, but greatly in evidence on the Reading branch until about 15 years ago. No. 221A (page 77) was one of a class of 110 engines designed by the late Mr. J. I'A. Cudworth. Built between 1859 and 1875, they were numbered as follows :—4, 9, 11, 13, 17, 18, 20 to 26, 28 to 35, 37, 38, 42, 45, 52 to 54, 56, 57, 60 to 64, 68, 71, 74, 75, 78, 79, 86 to 94, 101 to 105, 110, 112 to 114, 117, 118, 130, 132, 133, 142, 145, 185 to 196, 215 to 234, 242 to 253. Nos. 179 to 184, built in 1857, were practically similar engines. All of them had 6 ft. coupled wheels and 16 in. by 24 in. cylinders. The illustration shows the domeless boiler fitted by Mr. J. Stirling, this giving a heating surface of 956 sq. ft. and working at 140 lbs. pressure. As thus reboilered, engines of this class weighed 32¼ tons, of which 22⅛ tons was on the coupled wheels. They were



Photo] [*H. L. Hopwood.*

SOUTH EASTERN AND CHATHAM RAILWAY ENGINE, NO. 53.
240 Class. Wheels, 7 ft. Cylinders, 19 by 26 in.

handsome looking machines, the curves of the outside frames being very graceful. Other conspicuous points were the large size of the leading wheels (4 ft. 6 in.), a feature common to all engines designed by Mr. Cudworth ; also the heavy brass beading surrounding the open splashers of the driving wheels. The roofless cabs gave the engines an unfinished look, and we are at a loss to understand why Mr. Stirling never put roofs on, especially as he added rather high side screens to the original weather-boards. As they were, the footplates must have been very draughty, and the addition

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of roofs would have been but little additional expense, and an undoubted boon to the enginemen.

No. 277 (page 78) formed one of a class of 20 engines ordered by the Directors without consultation with the Locomotive Superintendent, and this circumstance led to Mr. Cudworth's resignation. Nos. 259 to 268 were built by Sharp, Stewart and Co., and Nos. 269 to 278 by the Avonside Engine Co., both lots being delivered in 1876. They had 6 ft. 6 in. coupled wheels, 17 in. by 24 in. cylinders and, originally, domed boilers. Mr. Stirling, however, rebuilt them with domeless boilers having 982 sq. ft. of heating surface, the working pressure being 140 lbs. The weight as rebuilt was 34¼ tons. The appearance of these engines was very neat, and the open splashers were retained to the last. Some years ago, it may be remembered, the South Eastern Railway Time-table Sheets displayed as a headpiece, a woodcut depicting one of these engines in its original state. The last of the Cudworth four-coupled engines in service was No. 247A, this being withdrawn in 1905, but the last of the "Ironclads" (as the 259 class engines were termed), had been withdrawn two years earlier, although they were of more modern build than the others. The photographs of 221A and 277 were taken in May, 1902, at Red Hill sheds, where the engines were then stationed. The Reading trains are now mostly worked by Mr. Stirling's 7 ft. bogie engines of the 240 class, represented by the photograph of No. 53, with its original boiler. Most of this class, however, have now received domed boilers.

Not many years ago, the South Eastern Railway owned what were probably some of the most antique specimens of coaching stock then extant on British railways. Many of them dated back to the 'fifties, and were exceedingly well built of teak and guaranteed not to wear out. Although long out of date, they were considered too good for breaking up, but serviceable enough for branch line traffic; consequently, many were relegated to the Reading branch, a line which, for some reason, always appeared to be regarded as the "backwater" of the South Eastern system in pre-amalgamation days. Whilst very many of these old vehicles have now been scrapped, some survivors are still running, but—it is only fair to add—not in regular passenger service;* being used as parcels vans, etc., and for the conveyance of hop pickers.

In the majority of cases, the Reading branch stations are the original buildings, dating from the opening of the line, and unlike many old South Eastern stations, which are timber built and sombre looking, are of pleasing design, neatly carried out in red brick and red tiles. Since the amalgamation of 1899 many improvements have been made on the branch. The line has been relaid and brought up-to-date, and the rolling stock now in use is of the same high standard as that working on other sections of the South Eastern and Chatham Railway.

* Except on the Canterbury and Whitstable line, where loading gauge restrictions prevent the use of more modern rolling stock.

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Railways in the Sandwich Islands.

By R. W. A. SALTER.

ANNEXED to the United States of America in 1898, the territory of Hawaii—a scattered group of islands—lies in the North Pacific Ocean, some 2,000 miles from San Francisco. It embraces Hawaii (4,015 sq. miles), Maui (728 sq. miles), Oahu (598 sq. miles), Kauai (547 sq. miles), Molokai (261 sq. miles), Lanai (139 sq. miles), Niihau (97 sq. miles), Kahoolawe (69 sq. miles), with a combined population of 192,000 souls, and several smaller uninhabited islands. These few particulars are necessary in order to present an idea of the constitution of the territory. Hawaii, Maui and Oahu lay claim to railways —the subjects of the present article.

The Hawaii Consolidated Railway Company (Limited), on the island of Hawaii, and the Oahu Railway and Land Company, on Oahu, have more than 100 miles of revenue track. The federal laws of the United States are applicable to these railways, and they are subject to the same regulations with respect to rates, passes, safety appliances, hours of work, etc., as on the mainland.

The Hawaii Consolidated Railway is standard gauge. Over the main-line (32 miles) from Hilo to Paauilo are worked three motor passenger trains and two regular passenger trains each way daily, except Saturdays, when either line is provided with three passenger trains. A freight train per day in each direction is scheduled over the main-line, while a regular mixed train is worked daily from Hilo to Kapoho and back.

Rolling-stock equipment comprises 7 oil-burning locomotives of different patterns, from 8-wheelers to moguls, all simple engines; 10 coaches, 48 box-cars, 45 flat-cars, 22 gondolas, and 4 stock-cars.

The roadbed is well ballasted with lava cinders, of which there is an inexhaustible supply at hand. The sleepers are made from koa, a native hardwood resembling mahogany, on which are laid 65-lb. steel rails.

Standard rules are not observed to any great extent, and orders and clearances are largely given by word of mouth.

The pay of men employed is approximately as follows: Conductors and engine-drivers £20 to £26 per month, depending upon their race and colour; brakemen and firemen £10 per month. In the two latter capacities native Hawaiian and Portuguese are employed exclusively. There is no overtime.

Freight trains are accompanied by two brakemen; passenger and mixed trains by one brakeman. The men have neither societies nor unions, and it is at the option of the management whether or not they are paid during sickness or injury; but in most cases allowance is made either in full or in part. The railway maintains a medical department for relief and benefit of employees. Conductors are required to make-up and break their trains at all points except Hilo, and obliged to make the extra journeys for this purpose without compensation other than their regular wages.

The president of the company is Mr. J. L. Galt, whose headquarters are at Hilo.

It would be outside the scope of this article to describe in detail the wonderful district traversed by the railway. From Hilo it runs within 9 miles of the crater of Kilauea volcano. A branch extends through Kapoho, near the Green Lake and Warm Spring in the district of Puna; while there is a shorter branch in the same district to Pahoa. The most remarkable scenic trip is over the Hamakua extension, which runs for many miles along the precipitous ledges of huge bluffs, through gorges, past waterfalls, and along surf-beaten precipices.

The narrow-gauge system worked by the Oahu Railway and Land Company, with headquarters at Honolulu, is of greater extent, and, perhaps, greater interest, than the line already described. Instituted primarily for the purpose of carrying sugar-cane from plantations, the rails were set at a gauge of 3 ft. Uniformity in this respect exists among all the plantation tracks, enabling an interchange of trucks on to the Oahu Railway. The Oahu Railway and Land Company is one of the most prosperous railway companies in the United States, maintaining its original purpose as a means of carrying sugar from the plantations to the coast for shipment. A large passenger traffic is derived, in addition, not only from

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labourers of the plantations, but from tourists.

The railway connects Honolulu with Pearl Harbout naval station, distant 8 miles from the capital, and is used for conveying supplies to the naval and military posts at Pearl Harbour and to Schofield Barracks, 20 miles away.

Of a total of 130 miles of revenue track, 71 miles form the main-line from Honolulu to Kahuku.

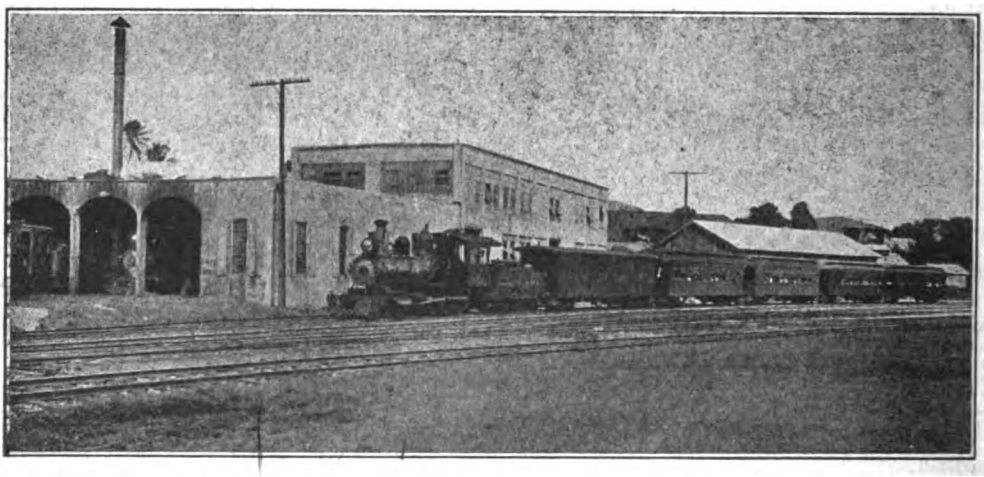
The company possesses 25 oil-burning locomotives, of several types, ranging from the dinky to the consolidated. Wagons number 655, and include box-cars, stock-cars, coal-cars, flat-cars, and pineapple-racks; passenger coaches amount to 48.

An up-to-date electric block signalling system has been installed, and works satisfactorily.

On all ordinary trains two classes of accommodation — first and second — are provided.

The entire system is laid with 50-lb. steel rails, and the sleepers are of Hawaiian hardwood and Philippine mahogany. The roadbed is ballasted with coral taken from Pearl and Honolulu harbours. Owing to local conditions on the island, oxidation takes place rapidly, causing deterioration to steel and iron soon before wear.

The maximum speed permitted for passenger trains is 30 miles per hour and for freight trains 20 miles per hour; but in the case of passenger trains, after deducting



OAHU RAILWAY AND LAND COMPANY, HONOLULU.
Local train and part of round house for locomotives.

The company works daily in each direction over the main-line two through first-class passenger trains; eight second-class trains between Honolulu and Waiaphu—thence *viâ* the Wahiawa branch into the pineapple district; eight second-class trains between Honolulu and Ewa Mill. And daily except Sundays two second-class passenger trains between Honolulu and Waiaphu and into the pineapple district; and four second-class trains between Honolulu and Puusla. In addition, the first-class limited passenger train is run on Sundays from Honolulu to Waialua, seaside and fishing resort. Of freight trains running daily except Sundays there are one over the main-line and two between the capital and Ewa Mill, and daily, except Saturdays, two between the same points.

flag-stops, a speed of at least 40 miles per hour is often attained.

Native Hawaiian and Portuguese brakemen and firemen are employed by the company, and receive from £10 to £12 per month, with overtime. Conductors and engine-drivers receive pay ranging from £15 to £30 per month, with no overtime. The relative percentage of Caucasians employed in the two last-mentioned vocations is about one to three in the favour of the natives. The maximum pay for Caucasian engineers prior to the increase granted as from May 1st last year was £28 a month, and for Caucasian conductors about £2 a month less; while the natives are graduated down to as low as £18 a month in both branches of the service. As in the case of the Hawaii Consolidated

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Railway Company, workmen do not enjoy the privilege of class organisations, and there are no contracts or working agreements; but the treatment they receive is commendable to the management. Sick or injured employees receive their wages as when in actual service.

The management of the railway is vested in Mr. B. F. Dillingham, president.

The Koolau Railway, 20 miles long, is worked in connection with the Oahu Railway, and extends from Kahuku to Laie, Hauula and Kahana. Its equipment is obsolete. Employees are mostly Hawaiian and the pay they receive is small.

On the Island of Hawaii there is also the West Hawaii Railway, having its headquarters at the port of Makukona, on the western side of the island. This short line was designed to carry sugar from adjoining plantations to the seaport for loading into vessels.

On Maui is the Kahului Railway, its headquarters being at Kahului, the commercial seaport of Maui, which was formerly an open roadstead, but now is partially protected by a breakwater. Steamers proceed directly to the wharfs and load to and from the railway, which is largely employed for transporting sugar-cane, pineapples and general plantation supplies, and which works a short passenger line from Kahului to Wailuku, the county seat.

The principal feature of interest in Maui is Haleakala volcano—whose summit towers 10,032 ft. above the sea—the largest extinct volcano in the world, with a crater of 10 square miles. On the crater's ridge stands a rest-house, whence is seen a remarkable panorama of tropical beauty, embracing magnificent forests of tree-ferns, giant hardwoods with their dense foliage, steaming and dead craters, and the many thermal lakes and springs which abound in the region.

In conclusion, it might be mentioned that Honolulu is reached from San Francisco in four days and a half by the Great Northern Pacific Steamship Company's magnificent passenger vessel *Great Northern*; while the combined sailings of the Matson Navigation, China Mail Steamship, Pacific Steam Navigation, Pacific Mail Steamship and Oceanic Steamship Companies average two steamers each way weekly carrying passengers between San Francisco and Honolulu. The Union Steamship Company of New Zealand (Canadian-Australasian line) also maintains a monthly service between Vancouver and Sydney, *viâ* Honolulu, Suva and Auckland, and there are various vessels touching at the islands with freight alone.

The Inter-Island Steam Navigation Company navigates steamships between the principal islands, practically monopolising inter-island traffic, but its rates are much above the average. The Great Northern Pacific Steamship Company has a service every twenty days during the season between Hilo and Honolulu, and Matson Navigation Company's vessels call regularly at Maui and Hawaii ports as well as at Honolulu.

The large increase in trade since the introduction of American government, and the development of various industries fostered by American capital, have greatly augmented the importance of Hilo, capital of the territory, as a commercial seaport. The harbour is charmingly situated in a deep bay. On completing the breakwater now under construction by the Government there will be provided a perfectly-sheltered deep-water port of splendid dimensions. Hilo itself is an interesting town, populated by 10,000, containing many important mercantile buildings, shops, and an excellent hotel.

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Locomotive and Train Working in the latter part of the 19th Century.

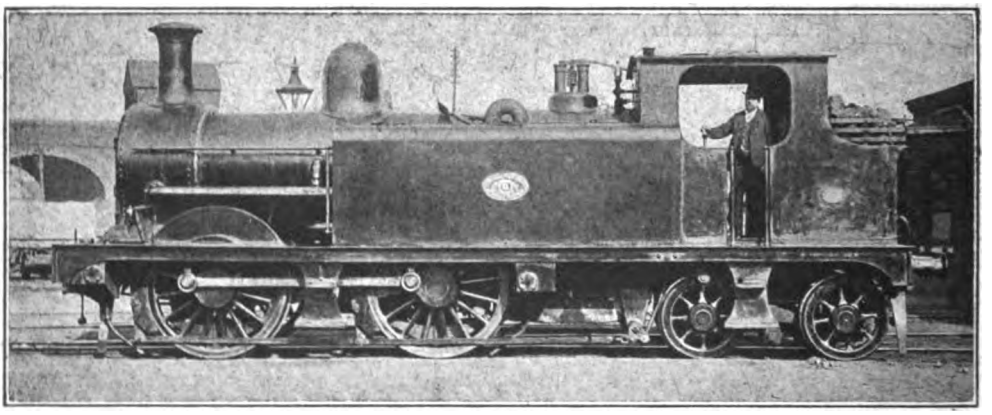
THE LONDON, CHATHAM AND DOVER RAILWAY. [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN the year 1875 the beginning of a complete change took place in the locomotives of the London, Chatham and Dover Railway, for in this year the earliest of Mr. D. Kirtley's modern locomotives appeared.

These consisted of 18 very powerful 0–4–4 side tank passenger engines with 5 ft. 3 in. coupled wheels, 3 ft. bogie wheels, and 17½ in. by 26 in. cylinders. The boiler pressure, as in the case of all Mr. Kirtley's earlier engines, was 140 lbs. These engines were Nos. 101 to 109 (Neilson & Co., 1875), 110 to 112 and 65 to 70 (Vulcan Foundry, 1875). They were put to work on the Metropolitan services from Victoria to Moorgate Street, and to Midland and Great Northern stations, and also on the Crystal Palace services, and they worked these trains for nearly 40 years until quite recently, when the services were discontinued. They were fitted with the Westinghouse brake some years after their appearance. When first built they were the most powerful passenger tank engines in the country.

Similar engines with 17½ in. by 26 in. cylinders, but with coupled wheels enlarged to 5 ft. 7 in. diameter, were afterwards put to work on the same services, viz.: Nos. 163 to 174 (Kitson & Co., 1880) and Nos. 75 to 80 (Stephenson & Co., 1883–4). These engines, all of which are still at work, are so well known to travellers in South London that further mention is unnecessary.



Photo] [*G. F. Burtt.*

MR. KIRTLEY'S FIRST 0–4–4 TANK ENGINE, NO. 101.

(Class 101–112, 65–70.) Built by Neilson and Co. and The Vulcan Foundry, 1875. Cylinders, 17½ in. by 26 in. Wheels, 5 ft. 3 in.

The London local services in connection with the Chatham Railway were somewhat complicated. The main line suburban services to Bromley and Bickley have already been mentioned when dealing with the work of the "Scotchmen" tank engines, and the greater part of these trains ran to and from the City (Ludgate Hill and Holborn Viaduct). Of the Metropolitan trains to and from Victoria there were three distinct services *viâ* Ludgate Hill, viz.: (1) Moorgate Street, (2) Wood Green (Great Northern

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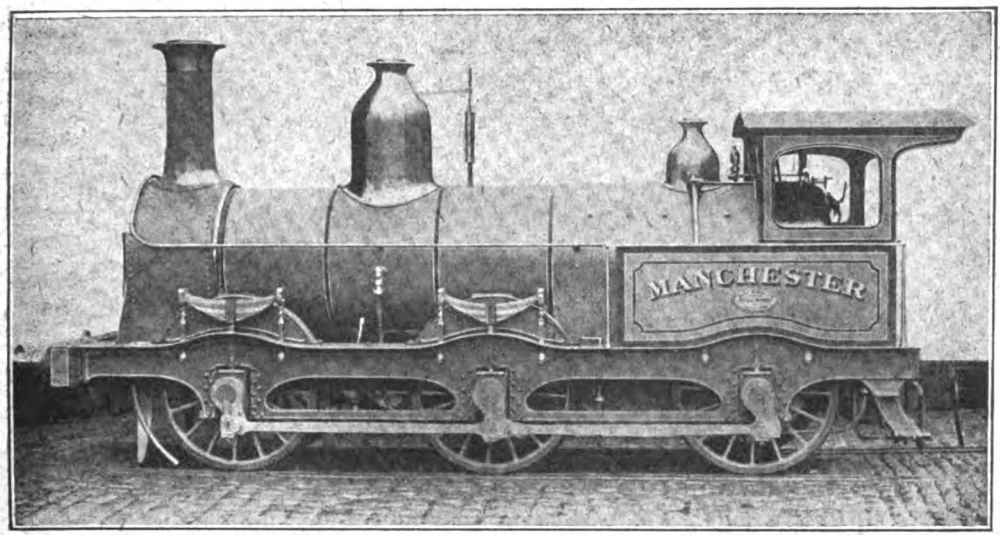
Railway) and (3) Hendon (Midland Railway). The Chatham tank engines worked through to Wood Green and to Hendon, and in their turn the Great Northern and the Midland engines worked into Victoria. The Crystal Palace services *viâ* Denmark Hill were worked from both Holborn Viaduct and Victoria, and this section may also include the extension from Nunhead to Greenwich Park, which was not completed until 1888. Finally there were at one time a few Chatham trains which ran from Victoria to Clapham Junction (London and South Western Railway). All the above services were worked by Mr. Kirtley's 0-4-4 bogie tank engines.



0-6-0 GOODS ENGINE.

This locomotive was similar to Nos. 113–118. Built by Sharp, Stewart and Co., 1862. Wheels, 5 ft. Cylinders, 17 in. by 24 in.
The *Manchester* was exhibited at the London 1862 Exhibition and purchased for the Egyptian State Railways in that year.

The locomotives were excellent, but the carriages were always poverty-stricken rabbit hutches. It was the one point upon which the then chairmen of the South Eastern and the London, Chatham and Dover were in most cordial agreement, and it would appear that the third class passenger was to be quietly but firmly forced to travel in a higher class—and pay for the privilege accordingly—by being made thoroughly uncomfortable in the thirds.

The short extension from Ludgate Hill to Holborn Viaduct was opened in 1874, and went by the name of The Holborn Viaduct Railway and Station Company. I suppose the underlying idea was to provide a more or less imposing City terminus to rival that of Cannon Street, and so extract continental main line traffic from the South Eastern. Holborn Viaduct has always seemed to me to be the most peculiar station in London. Situated on one of the main street arteries, it is so hidden by the hotel that the casual passer-by would hardly notice its existence. Inside it takes the form of a quadrilateral with a very narrow neck, through which the railway emerges in the direction of Ludgate Hill, and the sides are bounded by walls that effectually hide most of the daylight that might get into the station. From one point of view its position had considerable advantages, for it was much the nearest City station (serving lines to the South of London) to the big northern termini of Euston, King's Cross and St. Pancras, and was therefore very conveniently situated for passengers from the north of England, who were travelling to the Continent. And it was possibly this traffic, of which there is a considerable amount, upon which the Chatham directors had their eyes.

There is no London station that may be said to have had such an ephemeral existence. For some twelve or fifteen years it was a fairly busy station, and certainly tapped a good deal of the Continental traffic from the north of England. But as a City station for

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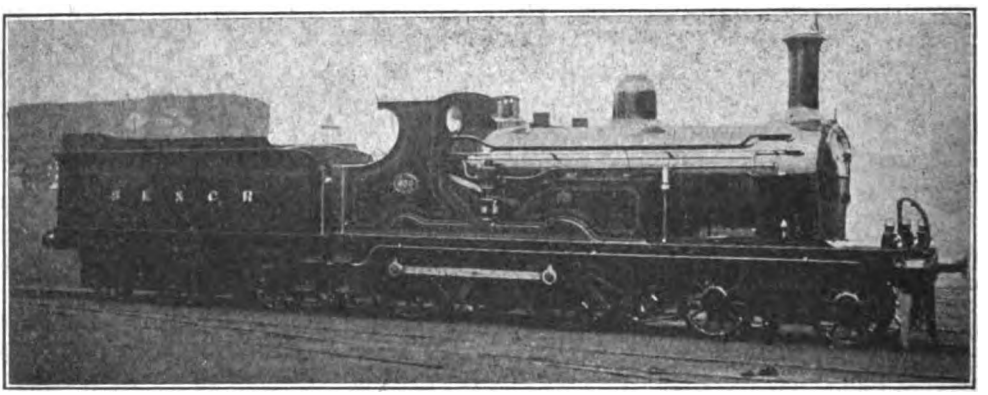
business men it never seemed to meet the need, and in 1886, when St. Paul's station was opened, the bottom began to fall out of Holborn Viaduct, and the process was completed when the fusion with the South Eastern took place in 1898.

At one period I saw a good deal of Holborn Viaduct station and travelled from it on a good many occasions in its palmy days. Then for more than twenty years I never went inside it, until in 1914 I happened to stroll in and have a look round. Compared with what I then found, Oliver Goldsmith's "Deserted Village" must have been a locality with considerable "go" about it. There stood at one of the platforms a few of the Chatham particular rabbit-hutch carriages—empty; not a solitary human being was to be seen until in about five minutes a particularly mournful looking porter put in an appearance. I asked him when the next train departed, and was told that the "next" train had gone twenty minutes before. He didn't even apologise to *Punch's* Irishman who invented this well-known "chestnut," in fact, I think he felt too dismal to see it.

Anyway most of the limited glory that Holborn Viaduct station ever possessed seems to have passed to St. Paul's. St. Paul's is a sort of distant extension of Ludgate Hill, and where the Chatham raised the money to build it nobody ever knew other than the few people who borrowed it. The new station was opened together with the new bridge at Blackfriars in May, 1886, and the neighbouring station at Elephant and Castle having taken its name from a public-house, it was decided on this occasion to counterbalance matters by naming the new station after a cathedral, this being the handiest building in the vicinity.

Returning once more to the locomotives, the first six express engines of what afterwards became the standard class on the line, came out in 1877 from the works of Messrs. Neilson & Co. These engines, Nos. 157 to 162, were of the 4–4–0 type with 6 ft. 6 in. coupled drivers, 17½ in. by 26 in. cylinders, and 140 lbs. pressure.

It might have been expected that the new bogie engines would immediately have taken charge of the fastest trains—the Dover expresses. Certainly they occasionally ran those trains, and they were also to be seen sometimes on the down Queenboro' Pier boat express, but for some reason which I do not know they did not run regularly on any of these trains, which continued to be worked by the "Mail" engines of the "Europa" class. In this respect the Chatham Company's experience was similar to that of the South Eastern with the "Ironclads" (259 to 278) of the latter company One or two Chatham drivers told me that the new bogies did not keep very good time on the Continental mail trains. Whatever the reasons, the fact remains that for some years they were relegated chiefly to the heavier seaside trains to Margate and Ramsgate. There may, however, have been the perfectly valid reason that these, being much the most powerful passenger engines that the Chatham possessed, were better suited for



MR. KIRTLEY'S STANDARD 4–4–0 EXPRESS ENGINE.

Built 1891 by The Vulcan Foundry. Coupled wheels, 6 ft. 6 in. Cylinders, 18 in. by 26 in.
The illustration shows engine No. 191 after it had become No. 650 of the South Eastern and Chatham Railway amalgamated stock.

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the heavy seaside trains. The Dover expresses, though considerably faster, were not very heavy trains, and always did well under the change of the "Europa" class, and there was then no reason for not "letting well alone." For this reason it would seem the old Mail engines were left to run the Dover expresses for many years longer, and I do not think they were displaced until after 1892.

It so happens that amongst my notes I possess the log of one of the "special" (sic !) Continental expresses of 1878, the year of the Paris Exhibition, made by a gentleman who was very interested in the new Chatham 4–4–0 engines. The train was the 9.20 p.m. night express from Victoria, which ran during the Exhibition and was afterwards discontinued.

ENGINE 157 (4–4–0), LOAD 13 COACHES.

	arr.	dep.	
Victoria..		9.20	
Herne Hill	9.28	9.36	
Beckenham	9.46¼		Speed 37·8 m.p.h.
Bromley	9.46¾		
Swanley	10.0		
Fawkham	10.6½		
Sole Street	10.12¾		
Rochester	10.21		
Chatham	10.24	10.37	
Sittingbourne	10.54¼		Speed 36·5 m.p.h.
Canterbury	11.21		
Dover	11.49		

The above was certainly not a good performance, though whether the engine itself was responsible I cannot say.

Additional engines of the 157 class appeared a few years later, when 175 to 180 were built in 1880–5 at Longhedge Works, and 181 to 186 were constructed by Messrs. Dübs & Co., Glasgow, in 1884. All these engines did most of their work on the seaside expresses. Of these there were two (one in each direction) that were fairly good trains and ran between Herne Hill and Margate at a speed of 43·8 m.p.h. They took 1¾ hours between London and Margate, and 2 hours to Ramsgate. These two "Granville" trains were the only two real expresses on the London, Chatham and Dover Railway that carried third class passengers.

The Dover expresses were run in competition with those of the South Eastern, and generally at the same times. One of the "Chatham" expresses in 1883 was timed to run through from Dover to Victoria, 78 miles in 105 min., giving a speed of 44·6 m.p.h., but the fastest train ran from Herne Hill to Dover at a speed of 46¼ m.p.h.

The best of the Dover expresses were equipped with the Westinghouse brake, but the efforts of the company in this direction began and ended here over a long space of years. The seaside expresses had to remain content with hand brakes until the close of the "eighties." With regard to the general service of the London, Chatham and Dover Railway, the following quotation is taken from Foxwell's "Express Trains":—"The little Chatham and Dover is to be praised for the spirited way in which it runs over its hilly route. But during a great part of the year it is wasting its substance on the seven Dover expresses, while duplicates of these are running at identical times on the neighbouring South Eastern. These 14 Dover expresses merely divide, and do not breed, any Continental traffic; for none of them are third class, and the fares are excessive."

In 1888 the maximum speed of the best Dover express had not increased beyond 46¼ m.p.h., but the time of departure from Victoria had been altered for the better by being modified from 7.40 a.m. to 8.20 a.m. The Queenboro' Pier expresses were never particularly fast, the time for the 50 miles being 80 min., a speed of 37½ m.p.h., but in this instance there was a portion of single line on the branch from Sittingbourne to be worked over.

Like most of the Southern lines, the proportion of goods engines to the total locomotive stock was small. Mr. Martley left 22 six-coupled tender engines in service, to which his successor, Mr. Kirtley, added 18 more between 1875 and 1891. All classes were very good engines, those of Mr. Kirtley being up to the standard of any of the northern lines.

In 1891 a modified class of 0–4–4 tank engine was put into service, of which 18 engines—Nos. 199 to 216—were built by Messrs. Sharp, Stewart & Co. In general appearance they were very similar to Mr. Kirtley's 163 class, and had the same diameter —5 ft. 7 in.—for the coupled wheels, but the cylinders of the new engines were only 17 in. by 24 in., though the boiler pressure was raised to 150 lbs. The heating surface was 1,071 sq. ft. These engines were not usually employed on the Metropolitan extension services, but took a share in running the suburban services to Bickley, etc., which did not require such heavy pulling. These were the last tank engines built for the "Chatham" as an independent company.

Hardly any appreciable improvement in the speeds of the best trains took place during the last years of the Chatham's

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separate existence. The best time to Dover remained as before, 1 hour 45 min., but there were two down and four up trains with this timing. These trains remained for the use of first and second class passengers only, but one each way was first class only. The best Queenboro' down train took 75 min. and the "Granville" expresses retained the 1hour 45 min. schedule to Margate and 2 hours to Ramsgate—these taking third class passengers. The four-wheeled coaches were still greatly in evidence on the seaside trains, in fact, six-wheelers were somewhat of an exception. The "Chatham" seemed to have reached its high-water mark some years before, and had possibly exhausted itself in the alterations which produced St. Paul's station.

The only change worthy of note was the replacement of the old 2–4–0 Mail engines by Mr. Kirtley's later 4–4–0 bogie express engines. The last series of these differed only in details from the earlier engines. The cylinders were enlarged to 18 in. by 26 in., and the boiler pressure was increased to 150 lbs. The heating surface of these engines was 1,120 sq. ft., of which the tubes provided 1,010 sq. ft. and the firebox 110 sq. ft. There were 22 of this later class, of which Nos. 187 to 192 were built by The Vulcan Foundry, 1891, and Nos. 3 to 7, 12 to 17, 19, 20, and 23 to 25 came out from Longhedge Works at intervals between 1892 and 1898. Two others which were to have been Nos. 8 and 26 appeared after the line had been amalgamated with the South Eastern.

The later engines did not seem to suffer from want of speed with the boat expresses in the same way as their earlier sisters had done, in fact, several of them had some very good runs to their credit. I believe No. 16 was considered to be the "crack" engine, or perhaps I ought to put it, "one of the crack engines," in order to do no injustice to the others. It was stated, and I believe truly, that on two occasions in 1896 she ran the 78 miles between Victoria and Dover in the remarkable time of 83 minutes with light trains. This gives the excellent running average of 56¼ m.p.h., and allowances must also be made for the difficulty in getting up speed in the crowded London suburban area and also for the slowing down over the Rochester curve. With these engines the following runs on the Continental expresses were made.

No. 17 with 180 tons, Herne Hill to Dover Pier, 74¼ miles in 95 min. 9 sec., including a loss of 2 min. slowing down for a bridge under repair. Allowing for this the net time was 93 min., which gives a running average of 48 m.p.h., and the maximum speed was 70 m.p.h. near Canterbury. The lowest speed up the bank to Shepherd's Well tunnel was 40·6 m.p.h. The same engine on another occasion, with 150 tons and without any checks except the "service" ones, took 96 min. 47 sec. for the same run, in spite of a maximum speed of 74 m.p.h. near Canterbury. No. 12, with 140 tons, made the run from Herne Hill to Dover in 91 min. 59 sec., in spite of a dead stop of 71 sec. for signals and two other checks, which made the net time barely 85½ min., but on the other hand, some other engines gave very poor performances, the worst being that of No. 20 with 160 tons, 102 min. 45 sec., and on the up journey No. 14 with 180 tons took 108 min. 49 sec., but with a strong side gale blowing.

The Chatham story ends in 1898. Marvellous to relate, one fine day the Chairman of the Chatham met his long-lost brother the Chairman of the South Eastern. They appear to have been armed not with battleaxes but with cigars, and having duly embraced one another, announced to an astounded railway world that the two railways had decided to run for the future in double harness—for better for worse. And there we leave them, the general public having pronounced a somewhat subdued blessing with reservations contingent on promises for future good behaviour.

Erratum.—On page 31, first column, line 11, in January RAILWAY MAGAZINE, Herne Hill should have been written Herne Bay.

[In March, 1918, RAILWAY MAGAZINE, Mr. E. L. Ahrons will deal with the Caledonian Railway.]

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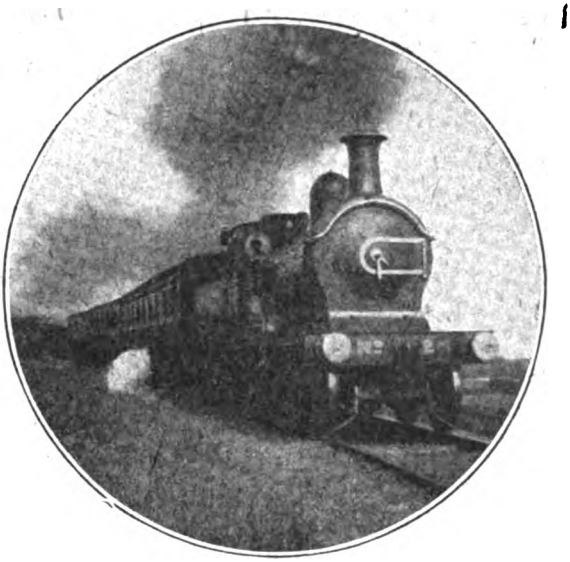
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*A. M. Willox.*

GREAT NORTH OF SCOTLAND RAILWAY.

Aberdeen express near Elgin, 4–4–0 locomotive, No. 28.

DR. J. G. ROBINSON, Chief Mechanical Engineer of the Great Central Railway, must be credited with having sprung on us the greatest locomotive surprise of 1917. Indeed, the engine concerned was actually in being before the first news of it was allowed to leak out in the railway press in the closing weeks of December, much too late, of course, for inclusion in our review of 1917 locomotive progress in last month's issue. In the year 1912 a noteworthy event happened in that Mr. Robinson reverted, in his 4–6–0 express "Sir Sam Fay" type, from his hitherto invariable outside cylinder practice with 4–4–2 and 4–6–0 engines, to inside cylinders of large dimensions. This change, which found further expression in the mixed traffic 4–6–0 engines of the "Glenalmond" class, was evidently only a half-way house. For the new 4–6–0 giant —No. 1169, *Lord Faringdon*—has both inside and outside cylinders, in each case taking high pressure steam, and uniformly 16 in. diameter by 26 in. stroke. The only previous multi-cylindered engines on the Great Central Railway are the four 3-cylinder compound "Atlantics," and also the 0–8–4 Wath shunting tanks and "Atlantic" No. 1090, which each have three high-pressure cylinders. But *Lord Faringdon* is the first Great Central 4-cylinder simple, and, if the experiment proves successful and the type is perpetuated, the Great Central Railway will be added to those lines—the Great Western Railway, London and South Western Railway, London and North Western Railway, and Lancashire and Yorkshire Railway—which at present favour this method of propulsion in express locomotives. The Great Southern and Western Railway of Ireland is also, as well known, experimenting with a 4-cylinder 4–6–0 engine, while our North Eastern Railway, under the *ægis* of Sir Vincent Raven, appears to prefer the 3-cylinder high-pressure arrangement.

Of all the lines which have given the multi-cylinder arrangement a really extended trial, only the London and South Western Railway has abandoned it, so far as new construction of express engines is concerned. This abandonment seems permanent, as Mr. Urie is now adding to his 2-cylinder 4–6–0 482–491 series, and to No. 335—the 4-cylinder 4–6–0 converted to 2-cylinder—a further series of 2-cylinder 6 ft. 7 in. and 5 ft. 7 in. 4–6–0's having cylinders no less than 22 in. diameter by 28 in. stroke. These are equivalent in piston area to 4 cylinders 15½ in. diameter by 28 in. stroke, thus showing that it is still possible to mount a couple of cylinders exerting a tractive force equal to that of the most powerful 4-cylinder engines yet built in this country. There are points in favour of both inside, outside and multi-cylinder arrangements. With inside cylinders the disturbing forces due to propulsion are much lessened by the fact that the cylinders are arranged as closely as possible to the centre-line of the engine. This is not the case with

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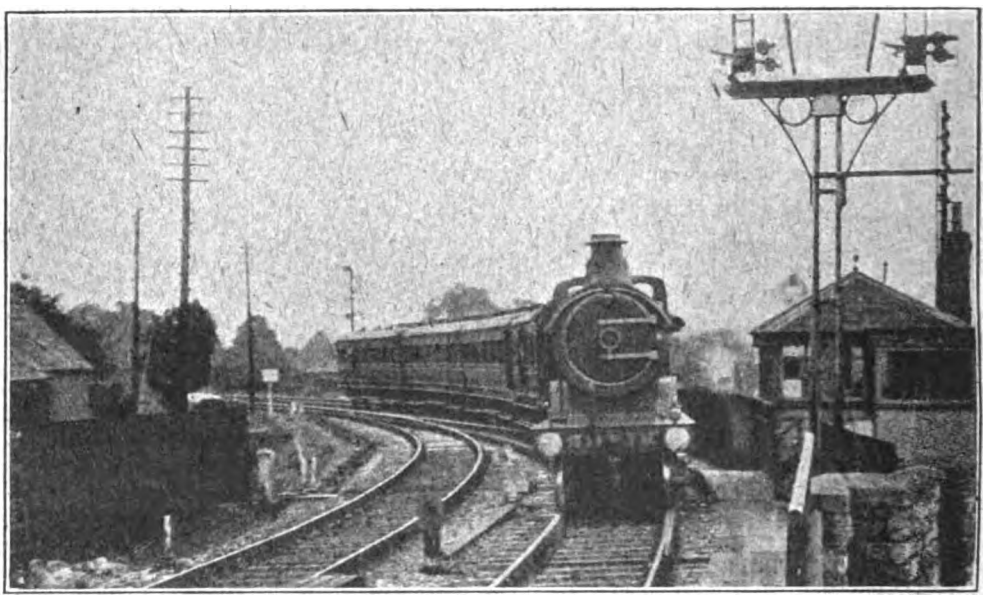
outside cylinders, but the latter have the merit of accessibility, within limitations they can be developed to a greater diameter than is possible in the cramped space available between the frames, and the absence of any necessity for driving on the leading coupled axle allows of a longer connecting rod. Multi-cylinder arrangements permit of the nominal tractive power of the engine being developed indefinitely, and at the same time simplify problems of balancing and result in a more sweetly-running machine, but they lead to multiplication of parts, and higher construc-tional and maintenance costs.

The new Great Central engine incorporates some novel features. Cylinders are arranged in line across the engine, those inside driving the leading coupled axle, and those outside the second pair of driving wheels, the latter being of 6 ft. 9 in. diameter. The inside cylinders are cast in one piece with a common central steam-chest, while those outside are fed and exhausted independently. Seeing that the adjacent cranks, outside and inside, are arranged at 180° with each other, the valves of each pair of cylinders move in unison, and are driven by the two upper arms of a three-armed rocking shaft, the lower arm of which is operated by a set of ordinary Stephenson link motion. Two sets of the latter, therefore, work all four piston valves. In order that the outside connecting rods shall not be of excessive length, the piston rod is extended, and the slide-bars are secured, not to the cylinders, but to a large cast steel bracket bolted to the frames. The dimensions of the engine generally correspond fairly closely with those of the inside cylinder 4–6–0 *Sir Sam Fay*, except that the volume of the cylinders as compared with those of the latter is increased by about 11 per cent. A similar boiler is fitted, but the fact that *Lord Faringdon* has 28 superheater elements instead of 24 is the cause of certain alterations in the heating surface, which totals 2,383 sq. ft., made up of 2,220 sq. ft. in the boiler and flue tubes, 167 sq. ft. in the firebox and 430 sq. ft. in the superheater. Grate area is 26 sq. ft. and working pressure 180 lbs. per sq. in. Out of a total weight in working order of 77 tons 18 cwt., 57 tons 3 cwt. are available for adhesion.

Before leaving this latest example of Mr. Robinson's designing skill, one cannot refrain from congratulating that gentleman in that his 2–8–0 or "Consolidation" superheater type of the Great Central Railway has been chosen by the British War Office as a standard for use overseas. A number of these engines have been built by the North



Photo] [*A. S. Wilson-Jones.*

SOMERSET AND DORSET JOINT RAILWAY.

South express approaching Templecombe station.

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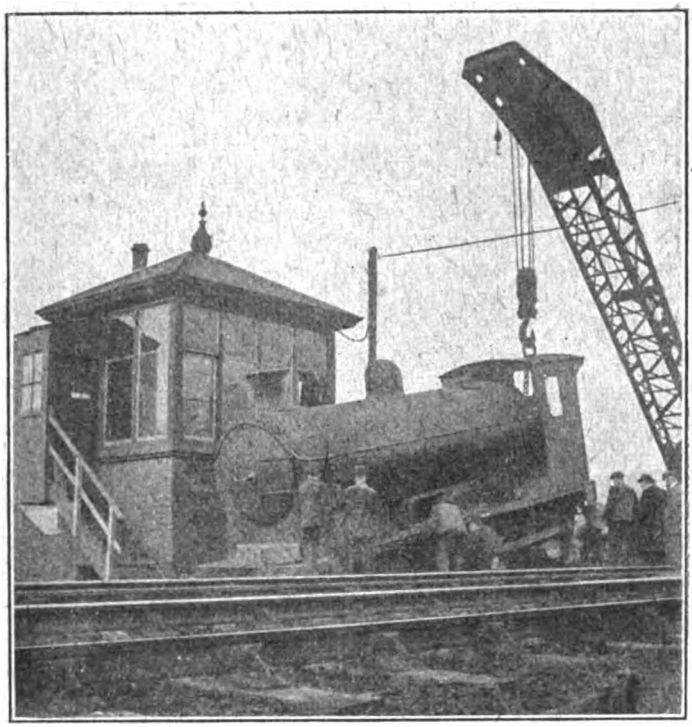
British Locomotive Company for this purpose, with but slight modifications of the original design, such as the provision of the Westinghouse brake and steam heating apparatus (for working troop trains), Ross muffled "pop" valves, etc. This may meet the eye of a correspondent who saw one of these engines at Basingstoke, *en route* abroad, and was somewhat puzzled thereby.

Another belated "surprise" of 1917 has been the conversion by Mr. H. N. Gresley of the de Glehn 4-cylinder compound "Atlantic" No. 1300, built by The Vulcan Foundry Co., Ltd., for the Great Northern Railway some years ago, into a superheater 2-cylinder simple with cylinders 20 in. diameter by 26 in. stroke, of the standard pattern supplied to the "Mogul" engines, driving on the leading coupled axle. The original boiler, with its 200 lbs. pressure, is retained, but the provision of a Gresley superheater has altered the heating surface to 1,367 sq. ft., tubes, 167 sq. ft., firebox, and 280 sq. ft., superheater, total 1,814 sq. ft. Grate area remains unchanged at 31 sq. ft. The adhesion weight is 37 tons 12 cwt., and the total weight 70 tons 5 cwt., in working order.

It is significant to note that both in the experimental conversion of No. 279 into a 4-cylinder engine, and now in that of No. 1300 from a 4-cylinder into a 2-cylinder engine, Mr. Gresley is adopting larger cylinder volumes than have ever before obtained in the case of the standard Great Northern "Atlantics." The four 15 in. by 26 in. cylinders of No. 279 are equivalent in piston area to two cylinders 21½ in. by 26 in., while No. 1300 has 20 in. by 26 in. cylinders against the standard 20 in. by 24 in. of the superheater "Atlantics." A similar tendency is apparent in the 2-6-0 and 2-8-0 engines of Mr. Gresley's design, and renders the speculation as to what may be his next form of express locomotive construction a particularly interesting one. It is reported that the converted No. 1300 has been doing some good work on the 5.30 p.m. express *ex*-King's Cross, which is without question one of the most difficult trains in the country to



Photo] [*M. Roy.*

NORTH BRITISH RAILWAY.

0-6-0 engine off the rails at Galashiels South signal cabin.

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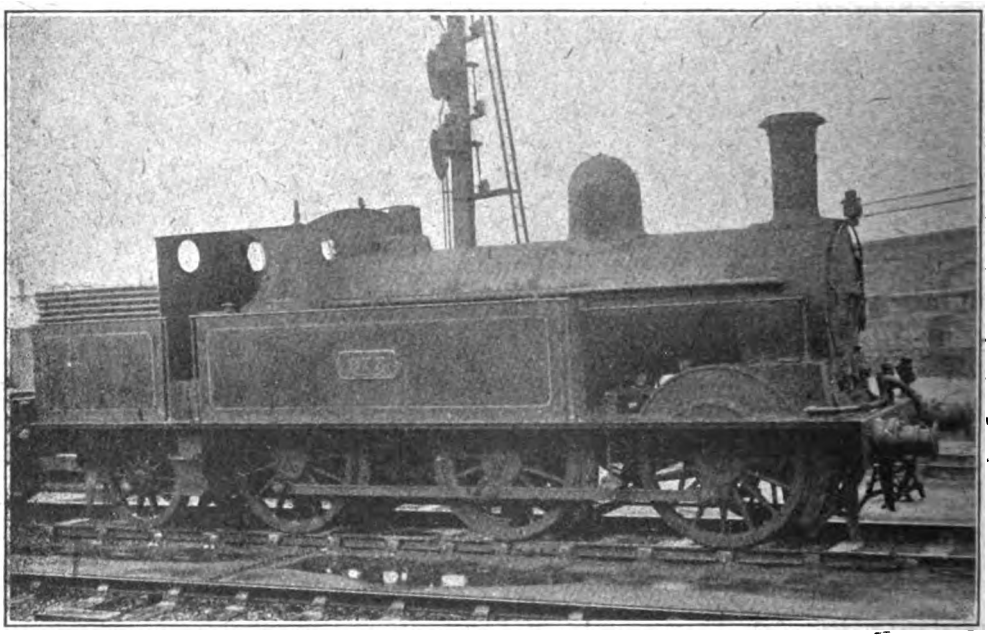
work to schedule at the present time, and often appears to call for the employment of an engine capable of exerting a higher tractive effort than is obtainable with the superheater "Atlantics." On my last journey with it only a few weeks ago, we lost 18 min. to Grantham—almost entirely attributable to poor running south of Hatfield and north of Peterborough with a net load of 443 tons, and a gross weight behind the tender of fully 475 tons.

Talking of 4-cylinder engines reminds me of a subject with which I promised to deal at an early opportunity, and that is the Great Western–London and North Western locomotive exchange of 1909. Some remarks that I made in the September issue of last year on this topic, in answer to a query, have given rise to a good deal of correspondence. The query referred to, after mentioning the undoubted fact that the London and North Western Railway 4–6–0 engine *Worcestershire*, of the "Experiment" class, failed to work the principal Great Western Railway expresses to time, and returned to Crewe in a strained condition, while the Great Western Railway 4-cylinder 4–6–0 *Polar Star* was at home on the heaviest and fastest London and North Western trains, asked the reason why. To which I replied that, in consideration of the fact that *Worcestershire* was a much smaller and less powerful engine than *Polar Star*, with a nominal tractive effort of only 16,420 lbs. as against 22,920 lbs., at 75 per cent. working pressure, it was a mystery to me that the London and North Western authorities should have expected a locomotive of such manifestly inferior steaming and tractive power to compete on level terms with the Great Western engine.

In the next issue—October—I was quoted by a correspondent, in *What the Railways are Doing*, as "recognising that the North Western engine, while the smaller of the two, was the largest express passenger type which had so far been constructed for that company." As a matter of fact, I am unable to trace having said anything of the kind, but the statement is not open to dispute, and will make a useful starting point for our present argument. Another young friend, writing me on the same subject with abounding enthusiasm, points out that "the result did not so much show how much *more* powerful the Great Western engine was, but how utterly *weak* the 'Experiment' was. Surely an engine boasting the name of



Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.

0–6–2 Webb side tank, No. 973.

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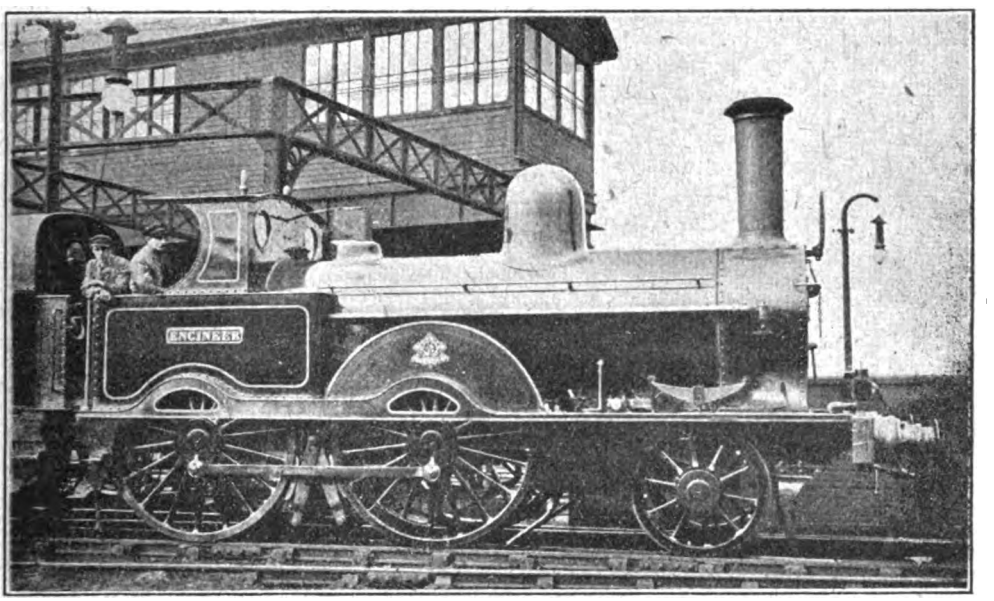
express, ought to be able to handle the 'Cornish Riviera Limited' satisfactorily at least *once*? If not, well, I can only believe that the people who travelled on the 'Cornish Riviera' would have received a rude shock when informed that they were travelling on a train that the *best* engine on England's so-called 'Premier' line could not manage!" And so on, *ad libitum*.

Now all this sounds terribly convincing and condemnatory. But let us examine the facts. For what purpose is a locomotive built? Is it in order that the engine concerned may participate in sporting events in competition with the iron horses of neighbouring roads? Or is it in order to convince other companies of the utter inferiority of their productions by leaving its own system in order to run their trains for them with hitherto unheard-of efficiency and expedition? My conception of locomotive building is that it is bound up with the two great controlling factors of railway operation—the duty of the railway to the public, and the duty of the management to the shareholders. The former is carried out, so far as the locomotive department is concerned, if the paper promises of the time-table are fulfilled in practice; the latter consists in performing the necessary haulage at the lowest possible expense as regards constructing, fuelling and maintaining the engines, so that there may be the maximum of return in profits out of the operation of the line. Is that agreed? Very well. Let us assume that at the time of these trials both the Great Western Railway and the London and North Western Railway had kept these essential points in view in the design of the engines which at that time constituted their standard types. Were these engines able to fulfil the twin duties that I have just outlined?

Let us take the London and North Western case first. In the year 1909 the London and North Western Railway afforded the fastest route from London to Birmingham, Wolverhampton and the Black Country, Liverpool, Manchester and Lancashire generally, Carlisle and Glasgow. So far as my experience and my records go, it was at that time one of the most punctually operated lines in this country as regards its express passenger traffic. In view of the weight to which its principal trains had even then grown, it is safe, I think, to assume that the public was satisfied with the facilities provided—at any rate, we do not hear of any wholesale transference of patronage to competing routes at that time. That is to say, the first duty—that of the



Photo] [*P. F. Cooke.*

LONDON AND NORTH WESTERN RAILWAY ENGINEER'S SALOON ENGINE.

This locomotive was the original *Petrel*. The second *Petrel* is likewise now an inspection engine.

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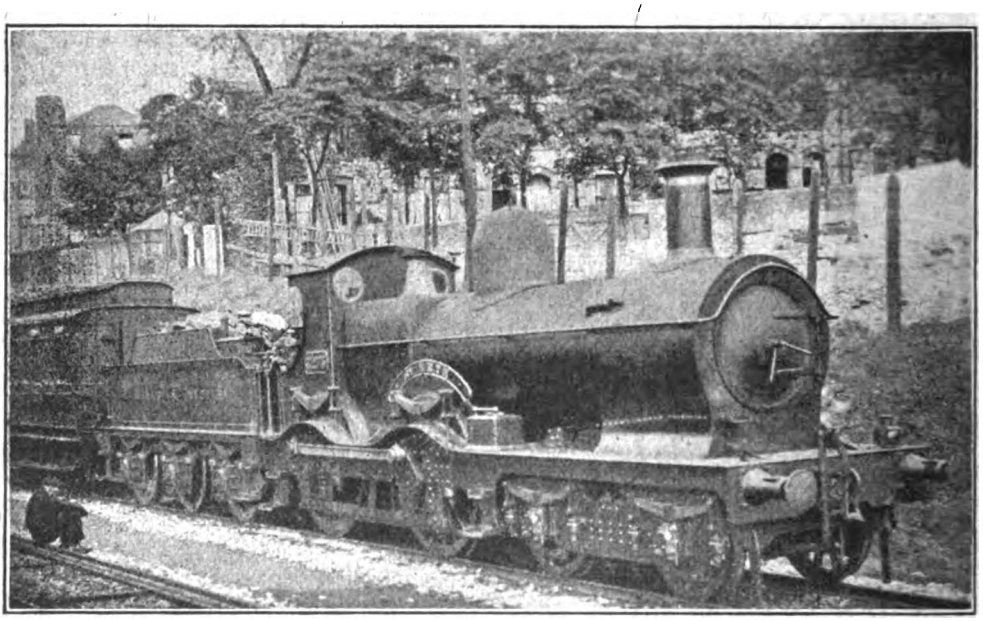
locomotive department to provide the management with locomotives capable of working the train services to time—was being fulfilled.

What about the duty of the management to the shareholders as to operating the traffic economically? At the moment of writing I have been unable to turn up the financial figures of 1909, but those of 1911 were very like them and will serve my purpose. In the latter year the London and North Western Railway paid a dividend of 6⅞ per cent. against the Great Western Railway 5⅞ per cent., and although the proportion of expenditure to receipts *in toto* was almost exactly the same on each line—about 63 per cent.—it may be noted that locomotive power cost the Great Western Railway an average of £1,003 per engine per annum against the London and North Western Railway figure of £975. A dividend of nearly 7 per cent. as far back as 1911 makes it clear that the duty of the London and North Western management to the shareholders was not being overlooked, and in the achievement of this result it would appear that the locomotive department took its share, as the locomotive costs were lower than those of the Great Western Railway. My object in introducing these apparently irrelevant figures, however, is an attempt to show that the London and North Western Railway locomotives of the period were performing both punctually and with reasonable economy the duties for which they were designed, so that the question of "smallness" does not arise.

And now as to the Great Western Railway. This company in 1909 was nearing the completion of a number of expensive "cut-offs" and loop lines designed to reduce the distance from London to all the principal points on its system. So far as the West of England was concerned, this capital expenditure arose out of the realisation that in the beautiful coasts and countryside of Devon and Cornwall there was a mine of wealth in holiday traffic, both by summer and winter, to be exploited, given sufficient initial outlay in development and advertisement. One of the necessary conditions of this exploitation was that the West of England should be brought as near to the Metropolis as the development of locomotive power would allow. As a part, therefore, of the furtherance of these aims, which, it would seem to me, the "Holiday Line" has deservedly brought to full fruition by a policy of enterprise almost without parallel in this country, we see the genesis of the



Photo] [*F. Roberts.*

GREAT WESTERN RAILWAY.

4–4–0 locomotive, No. 3275, *St. Erth*, at Plymouth.

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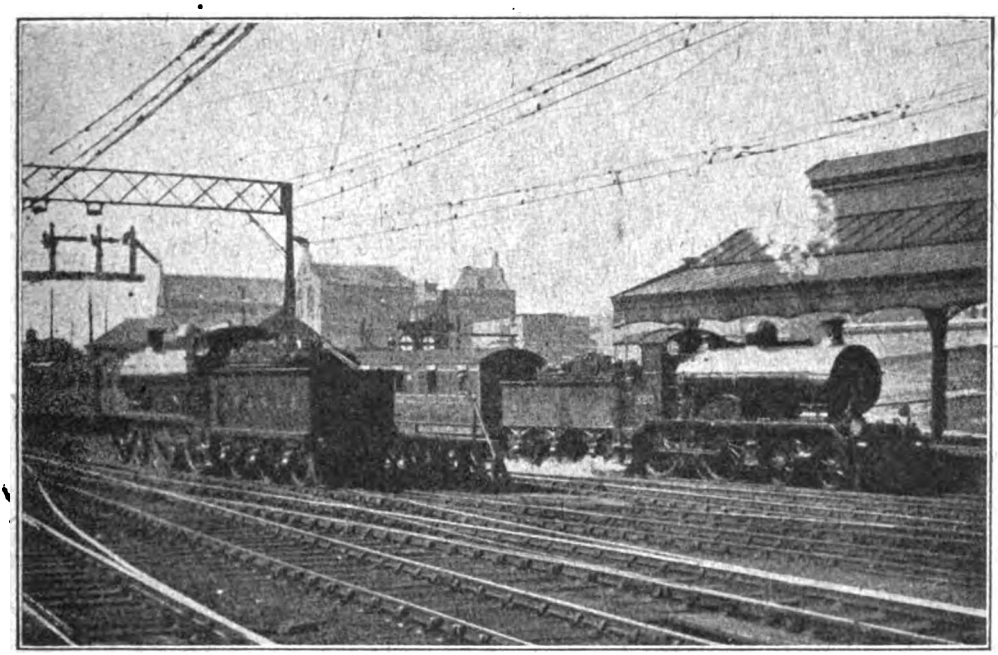
modern Great Western Railway 4–6–0 engine. With its aid the times to and from the West of England have been cut until some of them—as, for example, that of 3 hours to and from Exeter—are probably unrivalled in this country in point of difficulty, taking duly into consideration the grading of the route concerned, and the average loading of the trains. The Great Western Railway 4–6–0, therefore, was designed with the object of being able to cope with the conditions just outlined, and the success of the design is seen in the fact that as a rule it does so, brilliantly. But engines—4-cylinder propulsion and a Belpaire firebox—and it is, indeed, quite possible that the successful working of *Polar Star* on the London and North Western system may have influenced Mr. Bowen Cooke in adopting these features in his engine *Sir Gilbert Claughton*. But, after all, surely multi-cylinder propulsion and Belpaire fireboxes were getting fairly common in the year of grace nineteen hundred and nine, and were not confined alone to the Great Western Railway? The feature of *Polar Star* which was *not* common, and which neither Mr. Bowen Cooke nor any other British loco-



Photo] [*C. C. Burdge.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Re-built 4–4–0 locomotive, No. 320, entering Victoria terminus.
4–4–0 locomotive, No. 61, on the left.

I fail to see the reflection on the London and North Western Railway 4–6–0 of 1909, in that, designed to cope with London and North Western conditions of that period, it could not cope with the corresponding Great Western conditions.

It must be clearly understood that the power latent in a Great Western 4-cylinder 4–6–0 engine is purchased at a certain price. Much is made of the fact that the next London and North Western express locomotive design to issue from Crewe Works after this exchange of engines incorporated two prominent features of the Great Western motive superintendent has copied in a non-compound locomotive, is a working pressure of 225 lbs. per sq. in. And that is the feature which alone adds 25 per cent. to the nominal tractive force of an engine as compared with the 180 lbs. pressure of the London and North Western engine *Worcestershire*.

Now, as I remarked in the last paragraph, high working pressures are not secured, as some enthusiasts would seem to imagine, merely by the stroke of a pen, but have attaching to them a definite price. The construction of the boiler, firebox and steam

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passages must be strengthened, and their repair and renewal becomes more frequent, while the consumption of fuel in maintaining the pressure is increased. That is to say, the cost both of constructing, fuelling and maintaining the locomotive is enhanced. The whole tendency of modern British locomotive construction, on practically every line but the Great Western Railway, is to employ the advantage secured by high degree superheat in order to reduce as far as practicable the working pressure, and thereby to keep the engines out of the shops as much as possible. Thus, while the Great Western locomotive authorities retain the figure of 225 lbs. on 4-6-0 engines, on other lines we see reductions to 180, 170, 160 and even 150 lbs. per sq. in. It is not for me to decide which plan of the two is in the long run the more satisfactory economically, as the figures necessary to prove the point are not available to the outside observer. I freely admit that in the realm of performance a Great Western Railway 4-6-0 would, from my own timing experience, prove a formidable and probably a successful rival to any other express locomotive type in existence in this country, but from the economic standpoint the consensus of locomotive opinion in this country appears to be against the Great Western Railway in respect of the principal source of power from which these engines are able to draw—their high working pressure.

Reverting to the original point, I would repeat that *Worcestershire* and *Polar Star* were designed and built to work the traffic of their respective companies at that period, but *not* to exchange duties with each other. In view of the difference between the conditions of running on the two systems—as regards the principal trains—the issue of the test could hardly have been in doubt. I say again that I cannot imagine how the London and North Western authorities could have expected their engine—if, indeed, they did so—to cope with the fastest and heaviest Great Western trains, in view of the manifest disparity in tractive power between the two types of locomotive. But that is no disparagement to Crewe as regards the locomotive provision existing at that time for the

Photo] [*F. E. Mackay.*

GREAT EASTERN RAILWAY.

Up Norwich luncheon car express taking water from Ipswich troughs.
4–4–2 locomotive, No. 1530.
The photograph includes Mr. Cecil J. Allen, the writer of "British Locomotive Practice and Performance," standing beside the down line, on the extreme left.

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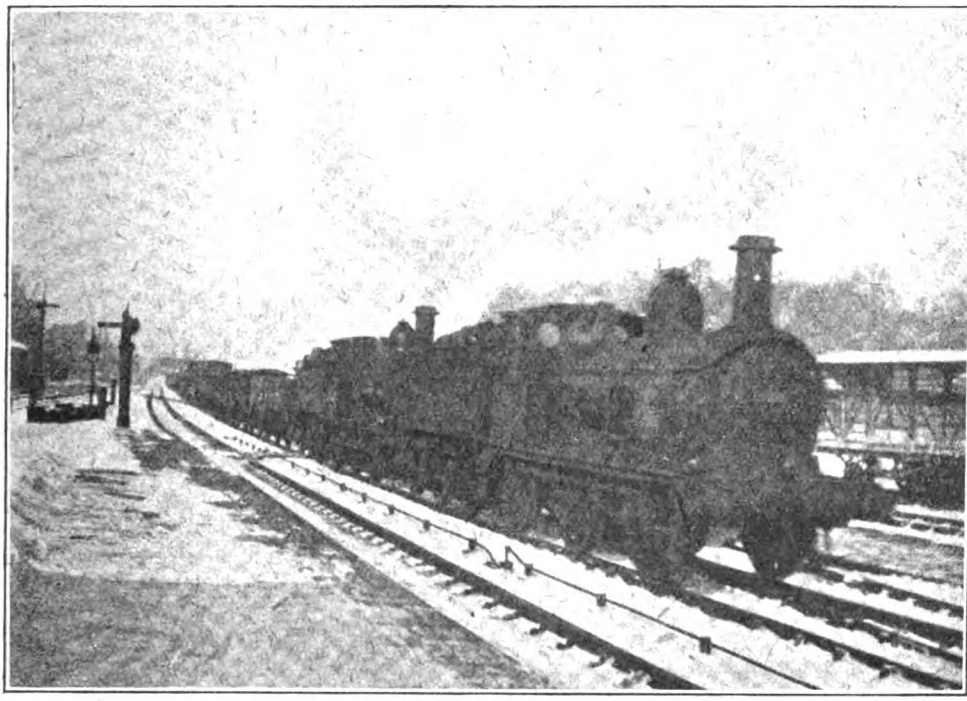
operation of the London and North Western system itself. Increased locomotive power then becoming necessary, Mr. Bowen Cooke adopted the unique but laudable method of exchanging engines with the London, Brighton and South Coast Railway, Great Northern Railway, Great Western Railway, North British Railway and Caledonian Railway, in order to ascertain by experiment the most suitable features for incorporating in his future designs. There seems little doubt that the performance of the Brighton and the Great Western engines had the greatest share in influencing the result, but it may, I think, be safely assumed that the principal and most characteristic source of the Great Western engine's power—the 225 lbs. pressure—was considered in the light of its ultimate cost, and was not therefore adopted. That, so far as I know, is the whole history of the Great Western-London and North Western locomotive exchange of 1909.

I am afraid that by now I have seriously overstepped the customary limits accorded to "practice"; I must atone for this, however, by a more generous instalment of "performance" in the next issue. I had intended dealing with some Scottish runs in this number, but in view of the limitation of space, I will hold these over instead until March, dealing instead, and perhaps more topically, with some recent runs on the Great Western Railway. Last summer I was able to renew acquaintance with the North to West route between Pontypool Road and Shrewsbury for the first time since the introduction of 4-6-0 engines on this section, and well worth making the trip turned out to be. By the kindness of a young friend who divides his time between his home at Cardiff and his school at Colwyn Bay, I am enabled to add the results of a number of his own careful observations over the same route to my own, the result being a collection of particularly fine performances. Indeed, I doubt if the Great Western Railway can show anything more noteworthy at the moment than the work which is being performed between Pontypool Road, Hereford and Shrewsbury. I described the gradients of this section in detail as recently



Photo] [*F. H. Stingemore.*

MIDLAND RAILWAY.

Double headed up goods train approaching Radlett after a snowstorm.

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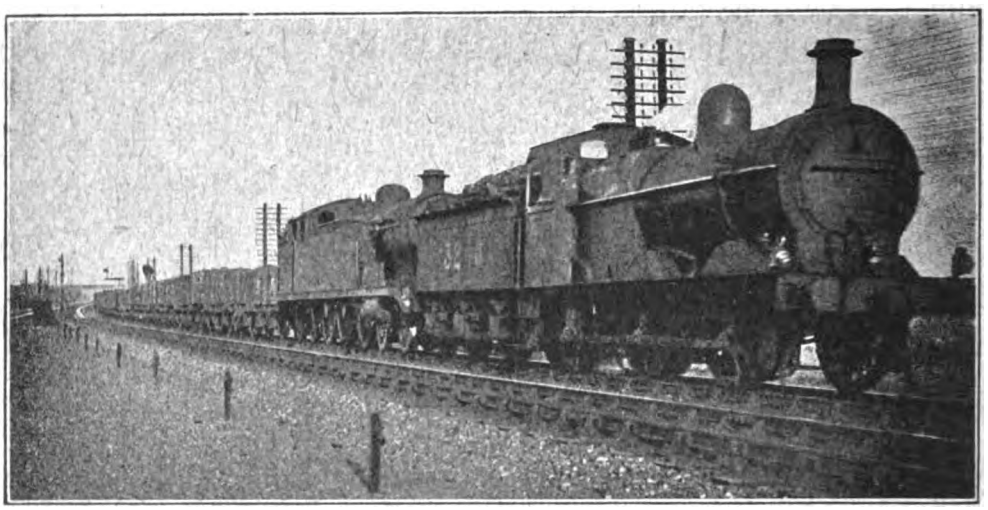
as May last, and there is therefore no necessity to recapitulate them.

On the 11.5 a.m. south-bound express No. 2905, *Lady Macbeth*, 2-cylinder 4–6–0, had a load of twelve 8-wheelers, 334 tons empty and about 360 tons full, and made a run which was distinguished principally by some very fast travelling beyond Church Stretton. Condover, 4·3 miles, was passed in 8 min. 50 sec., Leebotwood, 9·3 miles, in 15¾ min., and Church Stretton summit, 12·8 miles, in 22 min. 13 sec., speed having reached 51 m.p.h. on the undulations beyond Condover, and falling to 32 m.p.h. on the 4¾ miles at 1 in 90–100 past Leebotwood. Thence No. 2905 touched 70 m.p.h. between Marsh Brook and Craven Arms, and no less than 78 m.p.h. on the succeeding descent to Onibury (this figure is borne out by the intermediate times), covering the 7·1 miles from Church Stretton to Craven Arms in 6 min. 57 sec., and the 7·6 miles thence to Ludlow in 6 min. 7 sec. Slacking to 50 m.p.h. at Ludlow as prescribed, *Lady Macbeth* then covered the 4·6 miles on to Woofferton Junction in 4 min. 23 sec., attaining 72 m.p.h. on the descent from Ludlow, fell to 58 m.p.h. at Woofferton, and reeled off the 6·3 miles thence to Leominster in 5 min. 57 sec., with a top speed of 69 m.p.h. The 8·4 miles on to Moreton-on-Lugg were taken more easily in 8 min. 33 sec.—making a total of 54 min. 10 sec. for the 46·8 miles from the start—and Hereford, 51 miles, would have been reached easily in the even hour had it not been for a signal stop at Shelwick Junction. As it was, the total time was 62 min. 5 sec., or a minute under schedule. The 34 miles from Church Stretton to Moreton were covered in 31 min. 57 sec.

On the next trip, *Lady of Lynn*, No. 2906 of the same type, had a mixed load of 54 axles, weighing 329 tons empty and 355 tons full. The feature of this journey was an unusually rapid climb from the start, Condover being passed in 8 min. 42 sec., Leebotwood in 14¾ min., and Church Stretton in 20 min. 20 sec. After that matters were taken easily, the time from Church Stretton to Ludlow, 14·7 miles, being as much as 16 min. 25 sec.; from Ludlow to Leominster, 10·9 miles, 12 min. 5 sec.; and from Leominster into Hereford, 12·6 miles, 14 min. 46 sec., making a total of 63 min. 36 sec. from Shrewsbury. As this was a 65-min. train, however, the engine had 1½ min. in hand on arrival.

My own journey with *Lady of Lynn* and the same axle-load, however, was a much more rapid affair. In this case, the stock being almost entirely passenger-carrying, the tare weight was 361 tons, and the total load 385 tons. A good start was again made, Condover being passed in 8 min. 55 sec.,



Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Up coal train at Oakley, Beds. Water troughs in the distance.
Class 3 Belpaire 0–6–0 type engine piloting and superheater 4–6–4 tank

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Leebotwood in 15 min. 25 sec., and Church Stretton in 21¾ min. Speed actually rose to 52 m.p.h. at Dorrington, and the steepest 2 miles—10 to 11 and 11 to 12—were covered in exactly 55 sec. each—the final minimum rate being 30½ m.p.h. Subsequent downhill running, beyond a brief "spurt" at 75 m.p.h. past Bishop's Castle Junction, and another of 68 at Onibury, was not particularly fast; Stretton to Craven Arms took 7 min. 5 sec.; Craven Arms to Ludlow 7¼ min. (here we slacked with much caution to 45 m.p.h.); Ludlow to Leominster in 11 min. 50 sec.; Leominster to Moreton in 8 min. 40 sec.; and Moreton into Hereford in 5 min. 40 sec., with the usual very slow finish. This gave a total of 62¼ min. from Shrewsbury, or ¾ min. inside schedule. Minimum speeds at Woofferton and Dinmore Tunnel were 47 and 51 m.p.h., and maxima at Leominster and Moreton 57 and 65 m.p.h. respectively.

Finally *Saint Helena*, No. 2924, had to tackle a load on the 11.5 a.m. *ex*-Shrewsbury which totalled 59 axles, or some 430 tons all told, and lost 1¾ min. on the journey, but this was partly due to a check through Leominster. Condover was passed in 8½ min., Leebotwood in 15 min. 40 sec., and Church Stretton in 22 min. 38 sec., speed not falling apparently below the excellent figure of 30 m.p.h. on the ascent. Maximum speed on the succeeding down grade was 70 m.p.h., Stretton to Craven Arms taking 6 min. 52 sec.; Craven Arms to Ludlow 7½ min., and Ludlow to Leominster 12 min. 11 sec.; but the last section into Hereford was hampered by the Leominster check just mentioned, and took 15 min. 29 sec. Net time was about 63½ min., but an excess of only ½ min. over schedule time was creditable with this load, as even south of Church Stretton, despite the generally falling tendency of the road, there are constant sharp undulations.

In the reverse direction my north-bound trip behind *Tockenham Court*, No. 2954, was the most lightly-loaded of any; the train was the 2.33 p.m. *ex*-Hereford, and we had 50 axles on, 327 tons empty and 350 tons loaded. Dinmore, 7·5 miles, was passed in 11 min. (despite the 1¼ miles' rise at 1 in 75 from the start), speed increasing to 58½ m.p.h. at Moreton, and falling to 47 on the 1 in 100 through Dinmore Tunnel. Leominster, 12·6 miles, was passed in 16 min. 35 sec., Woofferton Junction, 18·9 miles, in 23 min. 40 sec., and Ludlow (where a long and exaggerated slack from 61½ to 45 m.p.h. was made), 23·5 miles, in 29 min. We accelerated to 54 m.p.h. beyond Ludlow, fell to 44 on the 1 in 112 rise beyond Onibury, recovered to 52½ at Craven Arms, and then went up the long final ascent to Church Stretton, much of which is at 1 in 104–112, with a lowest rate of 38 m.p.h. So we passed Craven Arms, 31·1 miles, in 38 min. 5 sec., and Church Stretton, 38·2 miles, in 47 min. 55 sec. A very gentle descent in Shrewsbury, nowhere even touching 60 m.p.h., completed the journey of 51 miles in 64 min. 20 sec., or 40 sec. inside the schedule allowance of 65 min.

On the next run a heavier load of 56 axles, or about 410 tons, was entrusted, not to a 4–6–0, but to a 4–4–0 "County"—No. 3832, *County of Wilts*—and for an engine of such comparatively moderate dimensions the running was very fine; indeed, from Dinmore onwards the driver would appear to have been going "all out," as the pace was exceptionally hot. Dinmore was passed in 12 min. 25 sec.; Leominster in 16 min. 43 sec.; Woofferton Junction in 23 min.; and Ludlow in 27 min. 5 sec., *i.e.*, the 16 miles from Dinmore to Ludlow were covered in 14 min. 42 sec., although the tendency of the road is distinctly against the engine. But the 7·6 miles from Ludlow to Craven Arms took 9 min. 21 sec., and the 7·1 miles thence up to Church Stretton 10 min. 52 sec., the final speed on the climb being 34 m.p.h. So Stretton was passed in 47 min. 20 sec., and Condover, 46·7 miles, in 55 min., in virtue of a faster descent than usual, touching 69 m.p.h. But the usual delays outside Shrewsbury made the total time from Hereford 63½ min.; net time was about 62½ min., and schedule 64 min., the achievement being quite a notable one for a "County."

Lastly there comes a run with the 2-cylinder 4–6–0 *Lalla Rookh*, No. 2982, and a 57-axle train, weighing 400 tons empty, and not less than 425 tons with passengers and luggage. In this case Dinmore was passed in 11 min. 40 sec.; Leominster in 17 min. 12 sec.; Woofferton in 23 min. 50 sec.; Ludlow in 28 min. 40 sec.; Craven Arms in 37¾ min.; and Church Stretton in 48 min. 35 sec. As usual the descent was very leisurely, and in this one case only could time be booked against the engine, as the total from Hereford to Shrewsbury was 65 min. 10 sec. instead of 64 min. Taken all round, however, this uniformly good running over a difficult road under such onerous conditions of loading is worthy of all praise.

I may as well complete the tale by giving

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the continuations of the same journeys south of Hereford in the cases where I have the details. On my south-bound run we added another 8-wheeler at Hereford, making a total of 415 tons, and also a pilot—4–4–0 No. 4125, *Khartoum*, of the "Flower" class—and after a simply interminable halt (why *are* they always so loath to part company with the passing traveller at Hereford?) resumed our journey 21 min. late. Red Hill Junction, 3·4 miles, was passed in 5¾ min., speed falling on the subsequent 1 in 104 ascent to 31 m.p.h.; Pontrilas, 12·5 miles, in 17 min. 25 sec., at 62½ m.p.h.; from there the 6¼ miles' ascent to Llanvihangel was breasted in 9 min. 25 sec., speed falling to 31 m.p.h. on the culminating 1 in 100. The descent to Penpergwm was taken cautiously, Abergavenny Junction, 24 miles, being passed in 31 min. 25 sec., Penpergwm (at reduced speed), 26·7 miles, in 34 min. 5 sec., and Little Mill Junction, 31·9 miles, in 41 min. 50 sec., the rate on the 1 in 50 beyond Penpergwm having fallen to within a fraction of 30 m.p.h. So we reached Pontypool Road, 33·5 miles, in 44 min. 35 sec.; the time allowed is 46 min. Of the other runs I have only the details of the Hereford–Pontypool Road stretch in the case of *Saint Helena* and *Lady Macbeth*. The former attached a "Bulldog" class 4–4–0 pilot at Hereford, the load being made up to a total of 470 tons (64 axles). On this run Pontrilas was passed in 18¼ min., Llanvihangel in 28¼ min., Abergavenny Junction in 31 min. 40 sec., and Penpergwm in 35½ min.; but the conclusion of the run was faster than mine, as the 6·8 miles from Penpergwm to Pontypool Road were covered in 9½ min., making a total of exactly 45 min. *Lady Macbeth* took forward her 360 tons unaided, and passed Pontrilas in 17 min. 20 sec., Llanvihangel in 28 min. 10 sec., Abergavenny Junction in 33¾ min., and Penpergwm in 36 min. 55 sec., the downhill running being somewhat unaccountably slow. Pontypool Road was reached on this occasion in 46 min., or 4 min. under the time scheduled, which in this case is 50 min.

In the reverse direction *Tockenham Court* took from Pontypool Road a modest load of 42 axles, or 275 tons, and exhibited some good uphill running. Penpergwm, 6·8 miles, was passed in 9 min. 10 sec., speed being reduced from 64 to 55 m.p.h. Then followed a fine ascent of Abergavenny bank, the 6·7 miles of continuous ascent from Penpergwm to Llanvihangel taking 11 min. The first 2¾ miles are at 1 in 153–154, but the remainder is inclined at 1 in 85–81–94, and on this we settled down to and maintained unvaryingly a rate of between 30 and 31 m.p.h. So Llanvihangel, 13·5 miles, was passed in 20 min. 10 sec., Pontrilas, 21 miles, in 28 min., Red Hill Junction, 30·1 miles, in 39 min. 20 sec., and Hereford, 33·5 miles, was reached in 44 min. 25 sec. Speed did not exceed 64 m.p.h. on Pandy bank, and was moderated to 50 m.p.h. through Pontrilas, while the usual slack was made at Red Hill Junction. On one of the other occasions 4–4–0 No. 4123 had a modest train of 140 tons, and from Pontypool Road passed Penpergwm in 8 min. 10 sec., Abergavenny Junction in 11½ min., Llanvihangel in 19 min., at 29 m.p.h., Pontrilas in 26 min. 35 sec., and St. Devereux, 24·4 miles, in 30½ min., but many signal checks in the last 3 miles made the total time 44 min. 33 sec. The net time would be about 42½ min., or 3½ min. inside schedule. One or two further runs between Bristol and Hereford in each direction I must hold over for lack of space, but these few just described will serve to show what excellent work is still being performed on these unaltered cross-country schedules while the majority of those on the main lines have been decelerated almost out of recognition.

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The French Railway Signalling Code.*

THE present signalling system in force on the French railways is largely based on a Ministerial decree ordaining the unification of all the signals used by all the companies. This reform, which has been long wished for, has come into force on all the French railways, and has, to their great satisfaction put an end to the numerous complaints which have been raised on this score.

The signals are intended either to show that the line is clear, or else to order immediate stoppage or slackening of speed—in other words, to act as guides. In all cases the absence of any signal shows that the line is clear. The signal to slow down, given to trains running at full speed, indicates that the actual speed must be reduced in such a way as not to exceed a maximum of 30 kilometres per hour in the case of passenger trains, and of 15 kilometres in the case of goods trains.

The signals are divided into two classes: optical and acoustic.

The optical signals, whose indications may be made on the track, in the stations or on the trains, are divided into two categories:—

1. Fixed signals, permanently mounted on a support, at some determined point, such as:—

Distance discs.
Square "dead-stop" signals.
Electro-semaphores.
"Slacken speed" discs.
Draw-bridge or turntable indicators.
Square indicators with green and white glasses.
Indicators showing the position of points.
Posts with inscriptions.

2. Moveable signals, which may be transported to any point of the line, or which may be carried on the trains or on the engines. The moveable optical signals for use on the track or at stations consist of flags, lanterns, cressets, boards, etc., which may be held in the hand or fixed in the ground. Those carried on the trains are flags, lantern, cressets, tail-discs, etc.

The acoustic signals, similar to the optical signals, may be given either on the track, at the stations, or on the trains themselves. The acoustic signals given from the track or from the stations are given by means of horns, trumpets, pocket whistles, fog signals, and electric bells. Those given on the trains are produced on the bell or gong of the tender, by means of the engine whistle, or with the horn carried by the chief guard.

Optical Signals.

I.—Fixed Signals.

These are placed to the left of, or above, the track to which they are intended to refer. If working be carried out on more than two main lines, the signals intended for each one of the lines must be placed in the immediate vicinity and to the left of the left-hand rail of the said line or track in the direction in which the trains are running, or above this line, excepting in the case of semaphores, the arms of which must all be placed in such a way as to be seen the one below the other, the uppermost arms relating to the direction to the left, and the lower arms to the direction to the right, taking the direction in which the trains travel. The intermediate arms relate to the intermediate direction, if there be such a direction.

Distance Disc.

This carries a round disc, one face of which is painted red with a white border. It is pierced by a hole fitted with a red glass. The distance disc can take up two positions in relation to the line it controls, *i.e.*, either perpendicular or parallel. The closed disc, *i.e.*, presenting to the train perpendicularly to the line its red surface by day, or a red light by night, indicates immediate stoppage, and also means that the point controlled by the signal must not be overshot. The hidden disc, *i.e.*, arranged parallel with the line by day, and showing a white light by night, indicates that the line is clear.

Directly an engine driver sees a closed disc he must at once control the speed of his train by all the means at his disposal, and must only go forward at a sufficiently reduced speed to enable him to stop in time on the section of the line visible, should an obstacle present itself or should a fresh signal order a stop. In any case he must never proceed to the first points or the first crossing protected by the signal, and he must not

* Translation from *L'Annuaire Marchal.*

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Fig. 1
Distant Disc

(Limit of Protection)

Fig. 2
"Protection Post"

(Limit of Protection)

Fig. 3
"Protection Post"

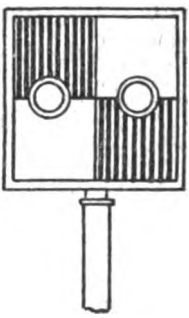

Fig. 4
Square "Stop" Signal

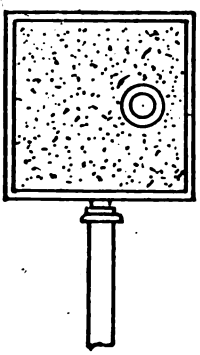

Fig. 5

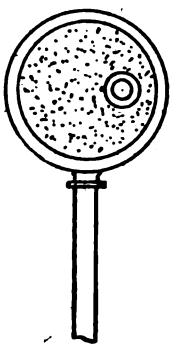

Fig. 6

"Stop" Signals

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proceed on his journey till after he has been authorised to do so either by the chief guard of the train, or by the stationmaster or other official at the point protected. The distance disc must be followed by a so-called protection situated on the slope or *banquette* of the line, and indicating, by means of an inscription in relief the limit of protection, the point starting from which the closed signal assures perfect protection. Generally speaking there is no protection post on the actual line, at junctions and at semaphore posts, where the trains are effectively blocked by the distant disc when they stop at the foot of the square signal or of the semaphore.

Square "Dead-Stop" Signal.

This carries a square plate, one side of which is painted with a red and white diamond, with a red border with white squares and with a white border with red squares; it is pierced by two holes.

It may take up two positions in relation to the line it commands—perpendicular or parallel. The closed signal—*i.e.*, presenting to the train, perpendicularly to the line, its face with the red and white diamond by day, and two red lights by night—orders an immediate and absolute stoppage, *i.e.*, no train or engine must pass the signal as long as it stands at stop or "danger." The hidden signal—*i.e.*, placed parallel to the line and showing a white light by night—indicates that the line is clear. On lines other than those travelled over by the trains in circulation, the dead-stop signal above referred to may be replaced, by Ministerial authorisation, by a square or round signal with a yellow face, showing a simple yellow light at night.

Electro-Semaphore.

Fig. 7 illustrates the electro-semaphore post. This carries on a post, and for each line, one or more long arms and one or more small arms. The long arms have a surface painted red and have two apertures, one of which is covered with a red, and the other with a green glass. The small arms are painted yellow, and have no signification as a signal for the engine drivers, serving merely to tell the signalman or watchman at a block section post of the dispatch of a train or light engine towards his post. They give their indications by day by means of the arm or arms, and at night by the colour of the light or lights shown.

The large arm which is seen projecting to the left, on looking at the semaphore towards which the train is travelling, relates to this particular train only. This large arm, extended horizontally, and presenting to the trains its red surface by day and two lights (one green and one red) by night, indicates the presence of some obstacle in the section of the line situated beyond the post or station where the signal post is located. Consequently, the semaphore post may be overshot by the trains or engines to the extent of a few yards when the large arm is at "stop," on the condition that it does not enter on the following section. It orders a dead stop. The large arm, inclined downwards at an acute angle, signifies "slacken speed." When lowered right along the post, and showing a white light by night, it indicates that the line is clear beyond the post or station where the signal post is placed, without prejudice, however, as regards any other signals which may be made to stop or slacken speed.

When working is carried out on several lines, the large arms of the electro-semaphores are placed in such a way as to be seen one below the other, the highest one relating to the direction most to the left, and the lowest to the direction most to the right, the intermediate arms relating to the intermediate directions. When the semaphore signals "stop," traffic beyond the post or station where the semaphore is located is forbidden, unless formal permission to go on be given by the stationmaster or by the person acting as such at the station or post, and on special conditions, be given to the engine driver.

"Slacken Speed" Disc.

This carries a round plate, one side of which is painted green, with a white border. It is pierced by an opening covered with a green glass. The "slacken speed" disc may take up two positions in relation to the line which it controls. The closed disc (*i.e.*, presenting its green side by day, and a green light by night, to the trains perpendicularly to the line) orders a slackening of speed.

The hidden disc (*i.e.*, arranged parallel to the line and showing a white light by night) indicates that the line is clear. In cases determined by the Minister of Public Works, special speed limitations may be indicated by means of white boards, illuminated at night and showing the figure to which the speed must be reduced. Boards, bearing in easily legible letters (illuminated at night) the word ATTENTION, may also (in cases determined by the Minister) be used to

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Ry. Mag.

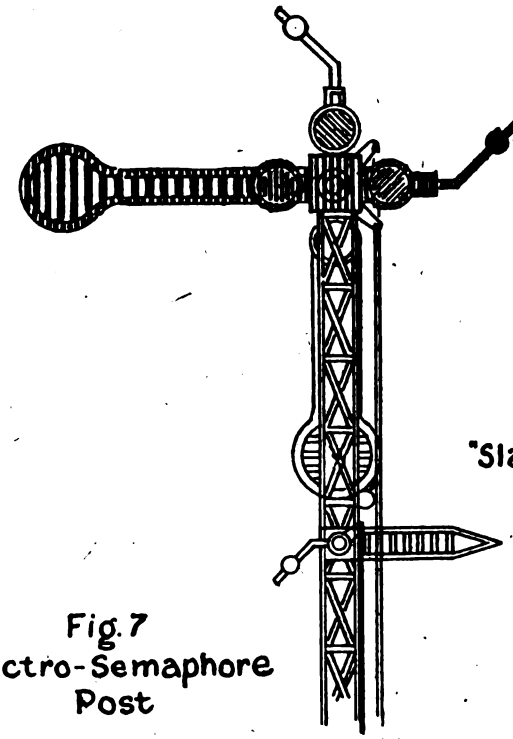

Fig. 7
Electro-Semaphore Post

Fig. 8
"Slacken Speed" Disc

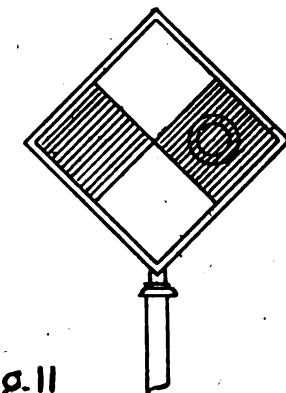

Fig. 11
Green and White Caution Disc

(Facing Point)

Fig. 9
Facing Point Disc Indicator

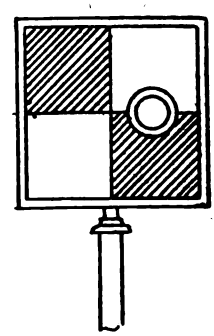

Fig 12
Green and White Caution Disc

(Swing Bridge)

Fig. 10
Draw-Bridge Disc Indicator

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indicate to the guards of the train that they must redouble their care and caution until they are again at liberty to resume high speed.

Bifurcation (Facing Point) or Draw-Bridge Indicators.

The indicator of bifurcations carries a plate on which there is inscribed either the word BIFUR or else PONT TOURNANT (draw-bridge) in black letters on an opaque background. It is lighted at night by means of reflection or by using transparent letters. Unless otherwise authorised by the Minister, this signal must be placed in such a way as always to give the same indication. These posts are placed at distances of at least 200 yards in front of a distance disc, which, in its turn, must also be at a sufficient distance from a square dead-stop signal. Furthermore, a square indicator, with a green and white diamond, is placed at a distance of from 800 or 900 yards away from a square dead-stop signal.

A square signal, with a red and white diamond, is placed at a distance of 120 yards from the point to be blocked, and, on lines traversed in one direction only. It is fitted with fog-signals or detonators, which are placed on the rail when the signal is closed. Finally a direction indicator, operated by the same pull on the lever that actuates the points, shows the driver the direction given by these points. Any driver meeting one of the preceding signals not hidden or lowered should prepare to stop, if necessary, at the junction or branch or at the dead-stop signal indicated by the said signal.

Square Indicator with Green and White Diamond.

This carries a square plate, painted with green and white diamonds, and is transparently illuminated at night. This plate is mounted squarely when it is at the normal distance of 800 or 900 yards from the dead-stop signal which precedes the indicator, and diagonally when it has only been possible to erect it at a distance less than this normal distance.

This signal, as just stated, precedes the square dead-stop signals, and when it is closed it forewarns the train attendants that the dead-stop signal is set at "stop." When, on the contrary, the square indicator with the green and white diamonds is effaced or hidden, it shows that the square dead-stop signal is not set at "stop."

Signals Indicating the Direction of Points.

These signals are distinguished as follows:

Direction signals, placed at the points or switches where the driver has probably to ask for a clear line by whistling.

Position signals, intended to show the guards of the train the direction given by the points—a direction which the driver does not need to ask for by whistling.

Direction Indicator.

This has two arms painted violet, and ending in a dove-tail cut or notch with a double point, which may extend to the left of the support, and each of which is pierced by a hole fitted with a violet glass.

By night the indicator shows two lights—one white, the other violet. The direction indicators are only placed at set-points where the driver must ask for the direction by whistling, and he is thus able to determine whether the direction given him is actually that which he has asked for.

When they are operated by levers independent of the points but locked together with them, they are mounted on a pole or post at different heights to a number corresponding to the directions which the post may give. The highest arm corresponds to the direction most to the left, and the lowest to the direction most to the right, each one being placed from the top downwards, in the order in which the directions are given, going from left to right. The arms can only take up two positions: the horizontal position showing that the corresponding direction is not given, and the inclined position, at an acute angle, showing the direction which is given. By night the horizontal arms show a violet light, and the arms, inclined at an acute angle, show the green or the white light, according as to whether speed is to be slackened or whether the train can pass at speed. When they are automatically moved by the points the pole or indicator, placed in juxtaposition to the switch, never shows more than one (apparent) arm. The arm appearing on one side by day, or showing a violet light by night, shows that the direction corresponding to this side is closed. The hidden arm by day, or a white light by night, shows that side the direction of which is given. When several bifurcations follow at the same post, then the apparatus are placed in the order of the directions to be taken, and their indications must be observed in the same consecutive order.

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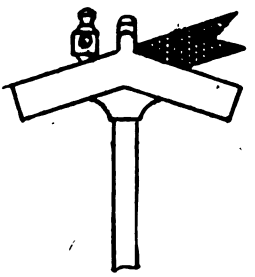

Fig. 13
"Direction Indicator"

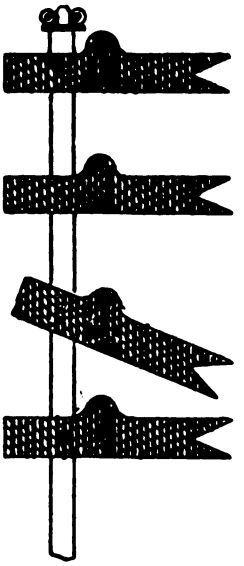

Fig. 14
"Direction Indicators"

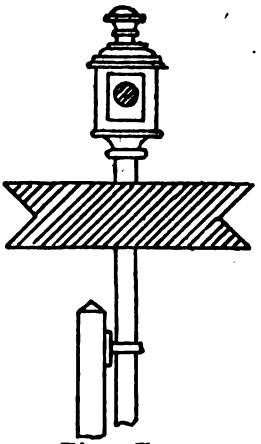

Fig. 15.
Point Position Indicator

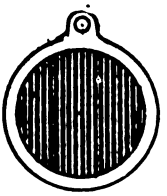

Fig. 16
Disc carried on Rear Vehicle by Day

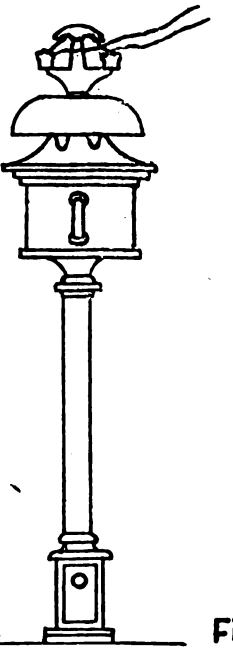

Fig. 17
Electric Bell Signal Post

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Point Position Indicator.

The point position indicator is intended to show their condition to the staff at the stations and termini. It carries a sheet-iron arm scolloped at both ends and painted green, and is topped by a four-light lantern.

The point indicator is connected to the moveable rails or switches which have a normal determined position, at which the engine driver does not need to ask for his direction. This indicator changes its position at the same time as the tongue-rails move when the points change their position. When the switch is moved for the normal direction, the arm stands parallel to the line, and at night this position is indicated by the white light shown at the side of the point and at the side of the neck or end of the switch. When the arm stands at full face on, *i.e.*, perpendicular to the line, or when by night the indicator shows a green light at the side of the point and of the switch end, then the switch is not moved for the normal direction.

Posts with Inscriptions.

Posts with inscriptions, other than the protection post mentioned above, carry plates inscribed, "Stop engines, whistle, whistle for direction" etc., or any other indication which it may be useful to give to the train staff. They are lighted by transparencies at night.

II.—Moveable Signals.

The ordinary moveable signals (hand signals) are given during the day by means of flags, any other article, or by the aid of the arms. At night, and during foggy weather, use is made of lanterns giving a white light, or a red or green light. Detonators are also used both by night and day. Line clear may be indicated by showing the trains: by day, a rolled-up flag, either uncovered or in its case, carried at "present arms," or by extending the arm horizontally in the direction followed by the train. At night, a motionless white light.

Immediate stoppage is ordered by an unfolded red flag held by a watchman in the hand. In default of a red flag a "stop" may be ordered by violently waving any suitable object, or else by holding up both arms above the head.

A red light orders an immediate stop. In default of a red light, a stop may be ordered by means of violently waving any light. The signal to slacken speed is given: by day with an unfolded green flag, held motionless, or by means of a green board stuck in the ground or carried in the hand; by night a green light indicates slacken speed. In case of slackenings of speed such as are rendered necessary by work or the state of the line, a rolled-up flag, a pendant of white colour, or a white light indicate the point at which speed must begin to be slackened.

III.—Signals Carried on the Trains.

Every train or light engine passing by day either over double or single lines must carry, at the rear, a tail-end signal consisting either of a red disc or of a tail-lantern. The latter must be carried at night.

Every train passing at night either over double or single lines, must carry in front at least one white head light and a red tail light placed at the back of the last carriage; two other lanterns must be placed on each side towards the top part of the last carriage or, if this be impossible, of one of the last carriages. These side lights must be arranged in such a way as to show a white light to the front and a red light to the rear. This arrangement is not obligatory for shunting trains having to run a distance of at least 5 kilometres. In this case a single red tail light will suffice.

In all cases where, in conformity with official orders in this matter, traffic runs in the opposite direction on a line having a double track, every individual train or engine passing in such direction must carry by day a red unfolded flag in front and, by night, a red light in addition to the white light or white lights just referred to. Goods trains must be distinguished from passenger trains by the addition of a green head light. Light engines shunting for service purposes in the stations must carry by night a white head light and a white tail light. Light engines running over the line, beyond the area protected by the station signals, must carry by night at least one white head light, and at least one red tail light, without prejudice to the special head signal in case of running in the opposite direction (tender foremost) over a double track line.

The companies may, when conforming with their special regulations approved of by the Minister, differentiate between the direction of the trains or engines by the relative position assigned to the head lights, and by the addition of supplementary lights. These supplementary lights may be white, or they may show any other colour except red.

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Accoustic Signals.

I.—Signals Given from the Line or from the Stations.

The trumpet serves as a signal to warn the line watchmen. A long blast on the trumpet announces the departure of a train or engine or, when on open line, their approach. Several consecutive blasts summon help in urgent cases of need. The horn is used in conjunction with the flag and the lantern by the men directing shunting operations within station limits, so as to convey their orders to the drivers. The cornet is used by the guards of trains to give the order to start to the engine drivers. The pocket whistle is used by the stationmaster or his representative to order the starting or stoppage of a train or light engine.

Detonators are used to supplement the "stop" signals when, either by day or night, owing to atmospheric troubles, such as thick fog or heavy snow and the like, these signals cannot be sufficiently perceptible at about 100 yards distance, or else when it is not possible to remain on the spot to give these signals to stop and, in any case, in order to double the signals to stop made by hand. In this case two detonators at least must be laid, and three in damp weather, namely, on each rail at an interval of 25 or 30 yards, and at a similar distance in front of the optical signal which they supplement. The use of detonators to supplement the moveable optical signals ordering a stoppage is obligatory when due to fog or other atmospheric troubles the optical signals cannot be distinctly perceived at a distance of 100 metres.

In case of *force majeure*, detonators may be used singly and independently of the optical signals, even in the absence of a man posted to give these signals on the spot. The explosion of one or more of these detonators is a signal to the engine driver to immediately control the speed of his train or engine by all the means at his disposal, so as not to advance at a speed exceeding one which can be reduced to a degree enabling stoppage to be effected within the length of the line section in view, should there be any obstacle necessitating an immediate stop. If, on leaving the point of explosion, after travelling a distance fixed by regulation, but not less than 1,000 yards, without any obstacle presenting itself or without meeting any signal ordering a stop, then the driver may resume his normal speed.

Electric Bells.

These inform the station staffs and platelayers, either to announce to a station, or to intermediate points, that a train is leaving a station and coming towards them, or else to dispatch signals of alarm.

Up trains are announced by three calls of two strokes, thus: xx xx xx.

Down trains are announced by three calls of three strokes, thus: xxx xxx xxx.

The call xxxxxx xxx xxxxxx xxx xxxxxx xxx signifies: Send a breakdown engine on the down line.

By replacing the groups of 3 calls with 2-call groups the engine would be wanted along the up-line.

The signal: xxx xx xxx xx xx xx repeated altogether three times, means: Stop all trains.

Each station is provided with two bells.

Signals Given on the Trains.

Steam Whistle.—All engines are fitted with a steam whistle, which enables the driver to communicate with the guards of the train, and with the watchmen at the stations and on the line.

Drivers must give:

One Long Whistle to Attract Attention.

(1) Before starting;

(2) On approaching stations even if not stopping there;

(3) Whenever they see the line is not clear, and especially if one or more persons are on it.

This rule is especially obligatory on entering and leaving tunnels, curves in cuttings, and on approaching level crossings in cuttings, or when the approaches thereto are masked or hidden. Drivers must also whistle whenever they perceive a train or a light engine coming towards them on the opposite line. Two sharp jerky whistles mean down brakes, and one short whistle up brakes. Long and repeated whistles ask for an auxiliary or relay engine. At facing points, and on approaching switches which have to be cleared at the points whatever the state of the signals on the line, the driver must ask for his direction by giving that number of prolonged whistles which corresponds to the track on which he is about to run, counting from the left.

With trains in motion, the guard at the head of the train communicates with the driver by means of the tender bell or gong, which he can operate from his van by means of a cord.

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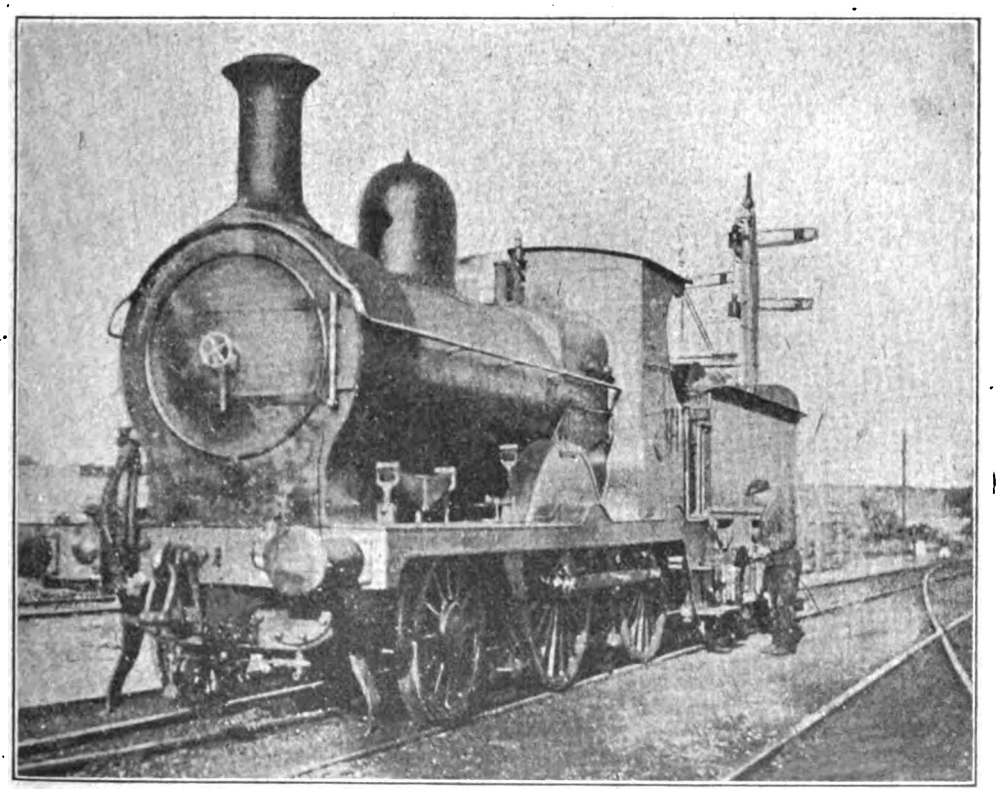
One stroke of the bell or gong means stop at once.

The intermediate guards signal the order "stop" to the guard at the head of the train, to the driver and to the linesmen, by waving an unfolded red flag, or a red lantern, turned towards the front of the train, from the window of their vans. On seeing this signal, the guard at the head of the train repeats it to the engine driver, by ringing the bell or gong on the tender. Every linesman, or line watchman, who perceives this signal in time must immediately signal "stop" to the engine driver and, if the latter does not see it, he must employ all the means at his disposal to have the signal to stop effectively communicated to the train by the next nearest signalman or watchman posted in the direction in which the train is travelling.

AN IRISH RAILWAY SCENE.



Photo] [*J. Macartney Robbins.*

MIDLAND GREAT WESTERN RAILWAY.
2-4-0 locomotive, No. 1, *Orion*, at Mullingar.

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By CHARLES DIX.

WITHIN recent years there have been many indications as to the progress of modern thought in regard to the moral obligations underlying the human relationship of nations, and no surer evidence of the spiritual reality of this evolution of thought could be provided than the present war against the brutal militarism of Germany which, oblivious to the rights of nations and regardless of moral law, sought to impose its materialistic sway over the destinies of Europe; and side by side with this spiritual progress there is a practical development silently and slowly going forward in the material world which is bound to have a powerful influence upon the actual relationship of nations and must prove an important factor in determining the destiny of the human race. In short, the land surface of the globe is gradually being connected up by the steel lines of the railway, which will ultimately form a girdle linking together all the countries, and embracing all the nations of the world.

If it were possible to stand upon some lofty eminence in the North of Scotland and, glancing through the United Kingdom, look out upon the world, from the shores of Europe over plain and plateau, forest and mountain, across the Steppes of Russia and wastes of Siberia, into the heart of China and away to the shores of the Pacific and Japan, one might well marvel at the power of human intellect and ingenuity, force and foresight, resulting in the conquest of matter and distance as evidenced in the laying of the railway line.

Commencing as it were with a single thread, the English lines are continued across the Channel, and as though woven with magic warp and woof, a wonderful network grows and extends along the waterways—choosing wherever possible the line of least resistance—but ever advancing Eastward, penetrating the high ground and, where necessary to trade or the community, overcoming all obstacles, until the whole land has the appearance of an immense living organism with a complete system of circulation through arteries, veins and capillaries.

The railways of Europe have the general appearance of a huge fan, half open, the handle in England, the outer circumference formed by the lines from Petrograd in the North and Constantinople and the Black Sea in the South, to Moscow in the centre; whilst the ribs of the fan are the Great Trunk lines running from Paris and Brussels over the Great Plain of Europe through Berlin; and the Central and Southern European railways through Vienna and to Constantinople.

From Moscow, the central point in the dividing line between Europe and the Far East, the Trans-Siberian Railway launches into the wilderness opening up Asiatic Russia, and eventually emerging at Vladivostock—incidentally breaking through Manchuria to Port Arthur and pointing the way into China *viâ* Pekin.

Obviously the natural route for the continuation of the Southern European lines across Asia is through Thibet; but Thibet, the most remarkable physical feature of Asia, presenting as it does a solid barrier of plateau upwards of 15,000 ft. high, crossed and re-crossed by stupendous mountain chains, prevents for all time the direct extension of the European railways across Southern Asia and lies impenetrable upon the Western frontier of China. The Northern plain of India, however, furnishes the natural alternative route, with an entry into China by way of Burmah. Already the great trunk system of the Northern Indian Railways covers the plain, which stretches for 1,700 miles beneath the shadows of the Himalayas from the Afghan frontier to Calcutta; but here again a difficulty arises, for Afghanistan, with its political considerations, lies obstructive on the Western frontier, preventing the extension of the Indian lines and forbidding the continuation of the European railways, with the result that the only existing through Euro-Asiatic

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railway communication has been forced along the track of the Trans-Siberian line.

Ultimately, however, means will undoubtedly be found whereby through rail communication will be secured between Europe and India and beyond, either through Afghanistan or, avoiding that awkward territory, by way of Persia, a deviation which perhaps presents fewer difficulties than the more direct route, and one which is indeed already more than indicated by the famous Bagdad line now under construction and the eventual control of which forms, perhaps, one of the most vital issues of the present war. Meanwhile the Indian Railway line running northward from Karachi as it ascends the valley of the Indus, sends out its spur to Quetta on the North-west frontier, awaiting the inevitable juncture.

Similarly on the Eastern frontier of India, the Burmese waterways along the valley of the Irrawaddy indicate the route of the railway which will in turn connect India with China across that country's South-west frontier, a somewhat difficult country, which has, however, been under survey and consideration for many years past; whilst the junction between the Burmese and Indian railways *vid* Calcutta may be regarded as an accomplished fact.

Thus from West to East the Great Northern Plain of India lying between Afghanistan and Burmah is already traversed by a system of railways in effective working, and with the junction on the West with the South Euro-Asiatic lines through Afghanistan or Persia and on the East through Burmah with China, there will be completed the second of the two great steel arms (the Trans-Siberian Railway north of Thibet being the other), extended as it were from England and Europe to embrace the Eastern world.

China is the immediate goal! A wonderful country with an area of a million and a half square miles; coal in every province and an unlimited mineral wealth practically intact and only awaiting Western enterprise.

China already maintains its immense population of three to four hundred millions without effort, but when its magnificent waterways are supplemented and developed by the railways which are being projected and constructed and the country opened up to trade and commerce, education and progress will naturally follow, and there can be little doubt that China must one day become a dominant power in the world.

The first step has been taken in this development in the shape of a great trunk line from Pekin in the North to Canton in the South, providing 3,000 miles of through communication and linking up the Eastern Provinces. The Northern section of this line has been worked for several years past over the 1,500 miles from Pekin to Hankow, a large port and trade centre situated about 750 miles up the river Yang-si-Kiang, which is navigable even beyond that point. This linking of the capital with the great river-port is significant as demonstrating the definite policy underlying the railway development of the country. For China abounds in great rivers, all flowing from West to East and offering opportunities for sweeping lines of communications between the great trunk line in the East and the vast provinces in the interior, lands of abundant richness, scarcely tapped, and overflowing with natural wealth hitherto closed in and sealed to the outside world. More significant still, the rivers of China indicate the direction of the connecting line with Burmah which will form the final link in the continuous railway system which, starting from England, will pass by way of Moscow through Europe and Northern Asia, and after traversing China from North to South, will return through Burmah, India, Southern Asia and Europe, thus completing the land circuit of the Euro-Asiatic world.

In Africa, too, a railway development is going forward similar to that in China. The great trunk line from the Cape to Cairo throughout the length of the country on the East, with numerous feeding lines running into it from the interior along the whole course of its route, will when completed offer the possibility of a future junction with the Bagdad Railway through Palestine, thus bringing Africa within the world embrace of perhaps the greatest civilising force that ever came into the hands of mankind.

Taken in conjunction with this suggested railway scheme, the announcement made some years ago that "the Czar had notified a resolution of the Council of Ministers in favour of the granting of a concession for the construction of a railway from the station at Kansk in Siberia to the Behring Straits, and the construction of a submarine tunnel under the Straits to the American Continent," presents the prospect, however dim at present, of a yet fuller realisation of the dream of a world railway scheme; for herein lies the near possibility of the closer union of the Old World with the New, the

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wider intercourse of their respective peoples, and all the advantages of personal contact which a continuous railway journey from Europe to America must evolve.

As though anticipating this consummation, the general tendency of the North American Railway system is towards the North-west. From the Gulf of Mexico, the Valley of the Mississippi indicates the direction of the railway running Northward, past Chicago and on towards the vast North-western territory of Canada—the great wheat district recognised as one of the greatest of the world's future granaries—and again on towards Alaska and the mouth of the tunnel gaping in prospective from Siberia beneath the Behring Straits.

With the recent revival of the Channel tunnel scheme, daily reference is made to the early probability of a through train journey from London to Paris and other Continental centres; but the prospective construction of the Behring Straits tunnel presents the infinitely more important probability of a through rail service from London to New York. But whilst it may thus bring East and West together, linking up the great population centres of the world—Europe, India, China and America—a world railway scheme, as here outlined, could scarcely of itself prove capable of assimilating such opposite forces; and if the universal expansion of the railways of Europe is to embody the functions of peaceful civiliser, the conclusion naturally follows that this expansion must be accompanied by a European economic federation combining unity of policy, thought and ideals with a unity of material power sufficient for their adequate support.

For, with the rise of Japan, a new star has appeared in the East, the effect of whose course in conjunction with the development of the Eastern world only the future can unfold.

ITALIAN STATE RAILWAYS.

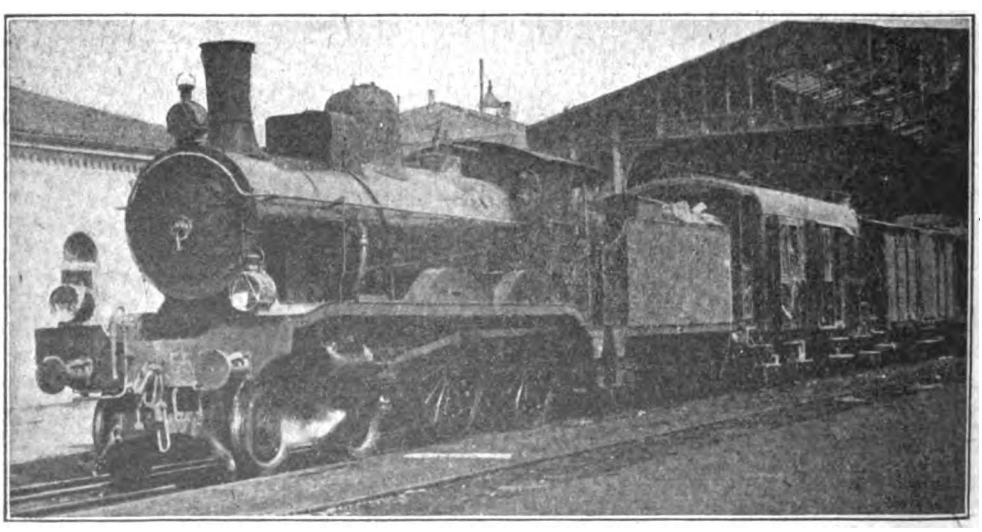

Photo [*J. Macartney Robbins.*

THE UNDINE EXPRESS AT VENICE.
4-4-0 locomotive, No. 5545.

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Railway Correspondence in China.

By HAROLD T. MOUSLEY.

HAVING been connected with one of China's important railways for a period of ten years, the greater part of which time was spent in the Traffic Manager's Office, many opportunities have presented themselves to me by reason of which it has been possible for me to collect and study the various styles of correspondence written in the English language by a race of people who are rapidly becoming Westernised, and in this article I intend to deal solely with correspondence that is received in the Traffic Manager's Office from Chinese subjects of and below the rank of Traffic Inspector, as well as a few letters from the public generally.

Notwithstanding the fact that the Chinese who were the authors of such letters and reports have only a very limited knowledge of English it is sufficient to say that, though many are written in the colloquial "Pidgin English" strain, anyone who has lived in this country and mingled with the natives in their business life can easily construe the meaning that such letters are intended to convey with very few exceptions. Nevertheless occasionally letters have been received from which no comprehensive meaning could possibly be derived, and in consequence of not having the time to solve Chinese puzzles during the busy hours spent in a Traffic Manager's Office, such letters are committed to the indispensable office receptacle called the waste paper basket, where they find a peaceful resting place for all time. I may say, however, that this course is not resorted to until inquiries have been duly made and every endeavour made to interpret the subject matter of these epistles so as to ensure the safety of the railway service and the travelling public.

For the information and guidance of the readers of this article I may mention that where a Chinese subject has gained a speaking knowledge of "Pidgin English," he invariably commits his thoughts to paper by means of phonetics, and not the slightest consideration is usually given to the correct spelling of any of the long or more difficult English words.

Out of deference to the railway with which I have the honour to be associated I refrain from divulging its name, as also the names of the writers of the various letters I have embodied herein.

The following are true copies of the letters to which I have referred above. First and foremost come the various applications for positions, the following being some very good specimens :—

"Dear Sir,—Hearing that you are in want of a clerk, I beg cordially to tender my service for same.

"I am nineteen years old and unmarried.

"I learned english for two years in chinese school.

"At present don't mean to apply for a job with big salary as in fact I want to get some experience from the business live.

"If however you mid accept me as a clerk in training at the biginning, it is so much the better.

"Should this application meet your favourable consideration we will be much obliged.

"Awaiting your word,

"I am,

"(Signed)."

"Most honoured sir :—Understanding that there are several hands wanted in your honour's department, I beg to offer you my hand.

"As to my adjustments, I appeared for the matric examination at Octy but failed, the reason for which I shall describe.

"To begin with my writing was illegible, this was due to climatic reason, for I having come from a warn into a cold climate found my fingers very disobedient to my wishes. Further I had received a great shock to my mental system in the shape of the death of my only fond brother.

"Besides most honoured Sir, I beg to state that I am in very uncomfortable circumstances being the sole support of my fond brother's seven issues, consisting of three adults and seven adultresses, the latter being the bain of my existence owing to my having to support two of my own wives as well, their

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issues of which by God's misfortune the feminine gender predominate.

"If by wonderful good fortune these few lines meet with your benign kindness and favourable turn of mind, I the poor menial shall ever pray for the long life and prosperity of yourself as well as your honour's posthumous olive branches.

"Yours faithfully,
"(Signed)."

"Sir,—Allow me to hope that you will take into consideration the letter which I have the honour of addressing you.

"Having learned your generosity to distressed individuals, I have the liberty to trespassing to your assistance. On the day in question, I beg to remind you for my last application, which I have been forwarded on the last month, and you told me to wait till the vacancy is occur, but I could not get any final reply yet.

"I am a family man who had a wife and children, so you may pity on us to give me a job.

"Further I beg to state I have been supporting my wife and children since five months and twelve days, and I could not able to support them any more.

"If such an honour be conferred I shall spare no pains to acute myself discharge my duties and give you every satisfaction.

"From the depths of my heart the God will bless and reward you by thousands and thousands of fold for your kindness.

"Thanking you in anticipation,
"I beg to remain, Sir,
"Your most obedient servant,
"(Signed)."

Even the Traffic Manager dearly loves a little humour when an opportunity presents itself, as you will see from the following:—

An application was received in person by the Chief Establishment Clerk, which he endorsed to the Traffic Manager as follows:—

"Applicant quite a good looking fellow, smart appearance, speaks English, and stands 10 ft. 3 in. in his stockings."

To this the Traffic Manager replied, "Four feet too tall. Can we use him for cleaning roofs?"

Needless to say he did not receive any appointment.

Accidents, which it is customary to report to Headquarters by telegram, come in for quite a lot of amusing brief reports:—

One of the best that came to my notice was the case of a Stationmaster reporting an accident which occurred to a passenger who jumped from a train at his station at which it was not timed to stop:—

"One passenger jumped from No. 4 down train at this station and killed four fingers."

It is also a common occurrence for locomotive failures on the road to be reported by telegram in the following phrase:—

"Engine No. —— train cannot walking send relief."

The following is a copy of a letter from the Chinese Traffic Inspector relating to an accident, which resulted in the death of a passenger whilst travelling:—

"Referring to the attached wire, I beg to report that the deceased being wounded limbs, seriously and a passerby, is to have neither belongings nor any relatives. No. 2 down has stopped at the place of accident about quarter of an hour to get the wounded carried on. Now the person died in ——— Hospital and the corpse had to be buried there.

"Kindly note.

"Yours faithfully,
"(Signed),
"Traffic Inspector."

This letter is of quite recent origin, but where the Traffic Inspector gets the idea that "the corpse had to be buried at the Hospital" I will not endeavour to explain.

The following telegram from the Stationmaster of the terminal station relating to the death of a passenger whilst travelling will no doubt cause some amusement in his attempt at mastering some medical terms:—

"On arrival of No. 9 up T.T.E. (Travelling Ticket Examiner) reported one 3rd class passenger holding —— to —— ticket died in T.L. 101 when train passed ——. Corpse removed and handed over to Railway Police; have instructed Loco. to have coach disinfected as no contageans disgase attached to corpse."

Students in training for a railway career afford no little amusement in their writings of the English language, as will be seen from the following:—

"My dear Teacher:—I beg to you see this letter from —— yesterday on you school do work one day. after go to my home in the little time when belly ache rised and colic and fever and to purge rise too. Hence e could not come your school do work in this few days.

"I hope you receive this letter and never excuse me.

"I am very sincerely,
"Your loving pupil,
"(Signed)."

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"My honoured old Teacher :—By looking at your advertisement I noted with much pleasure that you are now engaged as Acting Traffic Manager of the —— Railway.

"Owing to the long distance of Chinese five or six thousand li separated my home and I (Honan-Chekiang) am not so comfortable here ; will you please try your best to save me a position as a clerk in the office under you which may be suitable to my abilities.

"If wanted, please let me have a reply at your earliest convenience in order that I shall get ready to go on journey for Shanghai and pay you a visit after arrival, then telling you everything which has taken place during these few years.

"Thanking you for kindness for the past, present and the future,

"With sentiment of esteem,

"Your most loving and trustworthy pupil,

"(Signed) X. Y. Z."

"Do you know him ?"

Then there are the continual number of applications for increases in salary which bring forth an endless number of excuses far too good for any railwayman to miss a sight of.

The following are very original ones :—

"August 5th, 1917.

"The Traffic Manager,

"Dear Sir,—I beg to state that I have worked as 1st Guard on this line about two years without any mistake being made.

"I have married my wife in the month of the July 1917 and the expense is more than before therefore my pay is insufficient to covered up my family.

"I shall be very much obliged if you will favour me an increase at your earliest.

"Yours respectfully,

"(Signed),

"1st Guard."

"Dear Sir,—In consequence of house rent, vegetable, rice, and c, the prices which are greatly run up to high. My salary is only 25 dollars a month which are not quite enough to supporting my home. Parents are being old surely, they are depentent on my for their daily expenses.

"I have been married in the month of May of this year, the home spends are being doubled than when I was a single man. So I most respectfully begs that you will have the kindness to increase my pay, for granting which I shall be ever grateful. As I kept my works in excellent manner and no explaination explained, this is from careful attention to my duties. Will you have your good consideration and to increase of my salary.

"Your most respectful servant,

"(Signed),

"Night Station Master."

"Dear Sir,—In referring to your letter E.6053/2 of the 14th January 1910, hoping that having learnt that the occupiers of the situation for Station Master is in want of—now I may seize the opportunity I have been trained before the appointment in the —— Railway Traffic School and turning up this, have well practised the vocabulary took the place of Signaller at ——.

"The technical factor of my previous application gained the faithful sanction of Mr. —— is that the significant satisfaction has been genuinely given to.

"Should you do me the honour to select me for the profered situation, my energy and fidility will be sincerely operation in my working and in those the efficiency will shew subsequently.

"I have the honour to be, Sir,

"Yours most obediently,

"(Signed),

"Signaller."

"Dear Sir,—In obeying your order I have never written any application for promotion in salary since my appointment as Signaller about four years ago.

"For such a long period has elapsed, I beg to indicate the following conceived cases.

"In regard your letter No. E.6203/2 dated the 14th January 1910 I have exercised greatest care of procuring useful and improvable knowledge for that post.

"To yours of 19th July 1910 No. E.10334/2 I have had the honour to serve to the best of my abilities.

"I served this Railway two years and two months since and received no promotion either in salary or position.

"Trusting that the above paragraphs of this letter will give you every satisfaction and can gain your favour to give them favourable and just consideration ; and hoping that I shall be favoured with a reply in the affirmative.

"I am, Sir,

"Yours obediently,

"(Signed),

"Signaller."

A few copies of some amusing reports will, I think, tend to bring this article to an interesting termination.

The first is one from a native lady who lost her husband as the result of "Hard Labour" while employed by this railway.

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" Sir :—My husband Relief Station Master —— who had before joined service on your railway died by the cause of hard labour last year. He has left neither money nor property after his death. You have taken pity on me and given me his three months pay for which all of my family and I heartily thank you.

" I will carry my husband's coffin with his remains from —— to —— burial on the 10th October. I should be greatly indebted if you would kindly issue Free Pass to me for the purpose as a special favour.

" Yours faithfully,
" (Signed) The Wife."

Here is another, the mystery of which still remains unsolved :—

" Dear Sir,—I should feel obliged by your answer my application letter which I sent you on the 11th of instant, by Post Office,-as I can as possible, as I do explicate suspicions it now.

" I remain,
" Yours obediently servant,
" (Signed)."

The following is an interesting extract from a Guard's journal of his trip :—

" One Chinese passenger breathed his last after —— the corpse was delighted at —— re the arrangement of Traffic Inspector No. 2.

" (Signed),
" Guard."

I have omitted the names of the stations from the foregoing.

Here is another application for a position, the penmanship of which was hardly decipherable :—

" The traffic manager esq Sir,—I respectfully to say. I is inform yours. Want to you Telegraphic School learn the Telegraphic may. thank you very much you favour me. i is in 3 day time come visit you. wait you. thank yours. favour me. in two three days come see you. three day hence come see you.

" I am sixteen years of old and have read Chinese eight years and have read english 31.3 and a half years in the chinese foreign great school.

" Now i yes living in the city into.

" I am, sir,
" Yours obediently,
" (Signed)."

The following is an interesting appeal from a Pointsman soliciting the Traffic Manager's assistance in his family matters :—

" Sir :—I have been serving the railway as Pointsman for 5 years and 3 months. I have been married to a girl of Li's family for a long time, and am living with her at No. 8 room of the staff quarters. He has ever been a bad behaviour and he had teased women and made a trouble when he lived at the east points last year. Since he lived at the staff quarters last year, he trickily deceived and enticed my wife and adulterated her. I have been told of the shameful matter, so I paid attention to spy it, and I have eye-witnessed that this is an assertion. No. 1 Pointsman, Detective and my colleague advised —— to remove to other place, but he gave no notice to their advice. Further-more, he angrily looks at me and my wife insists upon me to give her a bill of divorce. I refuse to do so, she therefore makes incessant quarrel with me every day. I am much afraid that —— will kidnap my wife or my wife will probably attempt to privately kill me.

" I am compelled to bring this matter to your notice and hope that you will kindly inform detective to make enquiries into this matter. Kindly instruct —— to remove away to some other place, and he must furnish a guarantee that he shall break relation with my wife, and the guarantor shall be responsible for my wife not being kidnapped and my life not killed.

" Yours obediently,
" (Signed),
" Pointsman."

" P.S.— —— depends upon the influence of the foreigner and said that I shall be dismissed the service."

The following is a true copy of a letter received from the brother of an Interpreter in the Traffic Manager's Office :—

" Dear Sir,—I beg to inform you that my brother —— Interpreter in your Office, for sickness, has not attended his duty for four days.

" Please excuse me for late information. He has been attacked with diarhea last week. On Sunday morning he felt a little annoying and headache, till noon when the servant was calling him to take dinner, he refused and without an instant the contents of his stomack pushed out from above and below, and his complexion instanteously became pale, wan and fearful. Soon the coolness of the four limbs followed and the blood flowed slow. Doctors were sent for but in vain. Family were in sixes and sevens condition. The faltering cry was echoed and re-echoed but the sick man was sleeping. At about seven in the evening, all what vitality was left in him were that his heart a little jumping and a little warmth. Everyone was

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expecting his last breath, none was thinking that he could enjoy the day with us. In this crictical moment Dr. Waung stepped in, and this doctor was his saviour. He bleeded him and gave him brandy. Half an hour passed the sick man began to have pus and the limbs began to feel a little warm. At present Dr. Waung is curing my brother, and the sickness is somewhat like typhoid fever.

"He is at present unable to attend his duty so in hope you will be kind enough to grant his absence.

"With best regards,

"I am,

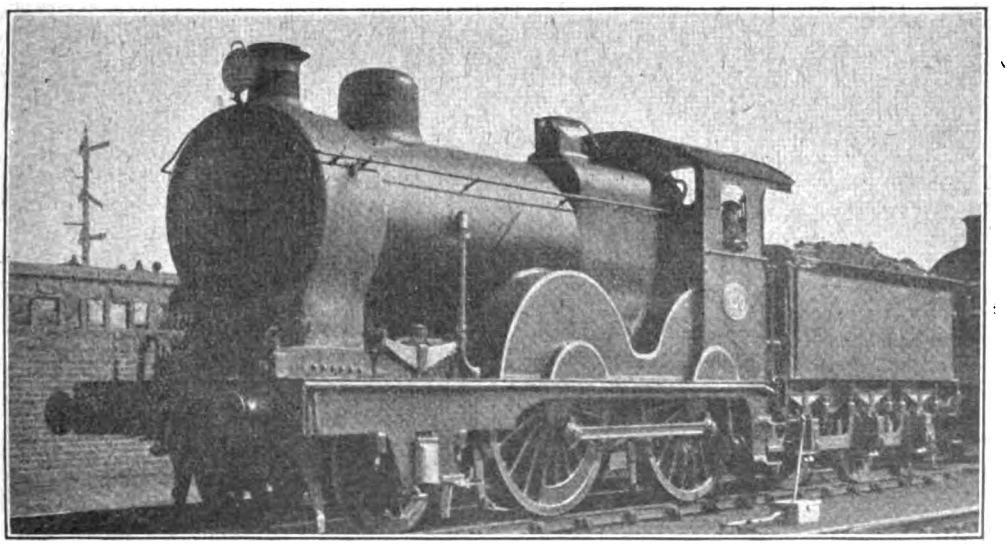
"Yours truly,

"(Signed)."

Although the greater part of the letters I have incorporated in this article illustrate the worst side of the question of illiteracy from an English point of view, I can testify to the fact that those of the Chinese who have had opportunities of receiving a collegiate tuition away from their native country do, as far as lay in their power, assist their nationals in improving their knowledge of English, and I believe, judging from the business relations I have had with the Chinese in general, the day is not far distant when the natives of this far Eastern country will be on an equal with their Western brethren.

Before concluding this article I should like to remark that it is not my wish to hurt the feelings of any of the native railwaymen of any rank in this country, and that the foregoing is written entirely in good faith and with all due respect to a race of people with whom I have had great pleasure in associating for over a decade. Though some of these letters may appear to be very crude, it might do well to here remark that they are masterpieces when compared with some I have seen and received from railways in the near East, where the English language has been taught by Professors for fully half a century.

A GREAT EASTERN RAILWAY REBUILD.



Photo] [J. Macartney Robbins.

2–4–0 LOCOMOTIVE, NO. 750, AT CAMBRIDGE.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Correspondents are requested to write on one side of the paper only, and they must give their names and addresses, but a pen-name or initials may be inserted for Editorial use.*

Railways and Canals.

A railway company may not (since 1873) make an agreement whereby it obtains control over, or power of interference with, a canal, without consent of the Railway Commissioners. And a railway company owning or managing a canal is bound to keep it in good condition, and open and navigable. Where a railway company is in control of, or has powers of interference with, a canal, the Railway Commissioners may, if it is proved to their satisfaction that the charges on the canal are calculated to divert the traffic from the canal to the railway to the detriment of the canal or traders using it, or adjacent canals, order an adjustment of the charges.

If a railway company, or one of its directors or officers on its behalf, and without express statutory authority, uses, or permits the use of the company's funds for the acquisition of an interest in a canal, such interest shall be forfeited to the Crown, and the directors and officers concerned shall be liable to repay to the company the money so applied, on proceedings for that purpose being taken by a shareholder.

Authority for the foregoing statements will be found in "An Epitome of Railway Law," by E. E. G. Williams, published by Messrs. Stevens and Haynes, Bell Yard, Temple Bar, London. It is a 5s. book.

[Reply to "WATER-BOB."]

Some London and South Western Queries.

During the summer the 12.30 p.m. and 2 p.m. expresses from Waterloo to Bournemouth have been run in duplicate, the first portion running non-stop to Bournemouth in, we believe, 2 hours 8 min. Corresponding arrangements have obtained in the opposite direction. Engines 330–334 work principally on goods trains between Exeter, Salisbury and Southampton, and Oxford and Southampton; 335 is engaged on mixed traffic main line service, and 369–373 and 720 on general main line passenger service. We do not undertake the provision of locomotive numbers. See rules at head of these columns.

[Reply to R. W. CLARKE.]

Cylinder Blow-Off Cocks.

The jet of steam seen escaping with some violence from the front of an inside-cylinder locomotive between the wheels is the exhaust from the cylinder blow-off cocks, which are provided in order that the cylinders may be cleared of condensed water, as, for example, when the engine is "priming" on account of an overfull boiler. These cocks are operated from the footplate, and the escape from each cylinder synchronises, of course, with the exhaust. In outside cylinder engines these cocks may be clearly seen under the cylinders.

[Reply to "STEAM."]

Eight-Coupled Goods Locomotives, London and North Western Railway.

The only 2–8–0 engines on the London and North Western Railway are 36 Webb 4-cylinder compounds, originally 0–8–0, which had a radial axle fitted at the leading end for weight distribution purposes. The remainder of the eight-coupled engines are all of the 0–8–0 wheel arrangement, some being 4-cylinder compounds with inside and outside cylinders, others having been converted from compounds to 2-cylinder simples with cylinders inside and the most recent being the superheater 2-cylinder type with inside cylinders.

[Reply to A. C. BLACKBURN.]

Some Midland Queries.

By the "old 864 class of engine" on the Midland Railway we assume you refer to the Belpaire 4–4–0 engines designed by Mr. R. M. Deeley and built in 1905; these are all still running and are numbered in the

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700's. No photograph of 2-6-2 engine No. 2299 has yet been published; as to any future photograph we fear we are not sufficiently gifted prophetically to say. As to the absence of 4-6-0 engines on the Midland Railway, see reply to E. A. Brothers in the November issue.

[Reply to HENRY WOOD.]

A Circuitous Route on the North Eastern Railway.

The 10.55 a.m. express from Leeds to Newcastle, North Eastern Railway, travels by Crossgates and Wetherby to Harrogate; thence *viâ* Ripon, Northallerton (Low Level) and Yarm to Stockton; from Stockton to West Hartlepool and thence by the coast line (*viâ* Horden) to Sunderland; and finally into the West End of Newcastle (Central) over the King Edward Bridge, avoiding Gateshead station. The last-named section is a somewhat unusual route for these trains.

[Reply to Lieut. F. W. FARQUHAR.]

The Fastest Train.

Until the recent decelerations the North Eastern Railway claimed the title of the "Fastest Train in the British Empire" for the 1.9 p.m. express from Darlington to York, seeing that its scheduled average speed from start to stop—44·1 miles in 43 min. = 61·7 m.p.h.—was the highest in the British Dominions. But as the line concerned is practically dead level the maximum speeds obtained did not constitute a record, nor the locomotive work, as the train was a light one.

[Reply to D. F. NICHOLLS.]

Maximum Speeds.

Maximum speeds, whether on the London and South Western Railway or any other line, depend entirely on circumstances and vary considerably, even with the same train at the same spot, on different days. The highest London and South Western speed yet recorded by Mr. Cecil J. Allen in "British Locomotive Practice and Performance" was one of 86·5 m.p.h. on the down journey between Sidmouth Junction and Exeter.

[Reply to R. W. CLARKE.]

Photographs of Moving Trains.

Mr. F. E. Mackay, who in the decade before the war achieved much fame as a photographer of railway trains travelling at full speed, is in military service. Readers who wish to communicate with Mr. Mackay may address letters to the RAILWAY MAGAZINE office, and they will be forwarded to him. Each correspondent should enclose a stamp for his reply.

[Reply to GORDON GRAVES.]

Great Central Railway Rolling Stock.

The reason why the whole of the coaches forming the expresses on the London Extension are not gangwayed together is that a certain proportion of non-corridor stock is now being employed in these formations, in order that the seating accommodation of the trains may be increased without a corresponding increase in their tare weight.

[Reply to T. G. FENDICK.]

2-8-0 Locomotives for France.

You probably mean now being built by the North British Locomotive Co., Ltd., for use by the British Government in France. These engines are of the Great Central Railway type and were illustrated and their dimensions given and details fully described in our contemporary the *Locomotive*, issue of December, 1917.

[Reply to LIEUT. W. A. C. MCCONNEN.]

Seven Stones Halt, Plymouth, Devonport and South Western Junction Railway.

Seven Stones Halt was erected to accommodate special trains with school children in connection with the Phœnix Pleasure Grounds, and in consequence of the grounds having been closed for some time past, the name of the halt has been omitted from the time-table.

[Reply to P. H. PEDRICK.]

Brakes.

In modern tender locomotives the steam brake, where employed, is usually arranged to apply to the tender wheels also, supplemented by the hand brake for use in case of need. It is very unusual, at the present time, to fit the hand-brake to the engine itself, in the case of tender engines.

[Reply to "STEAM."]

"Railway Year Book."

The twenty-first annual edition of this standard railway reference work is in preparation. It will be published as soon as the final figures for 1917 are available, and the book can be completed. This will probably be about April next. It will be published at 5s., by post 5s. 5d.

[Reply to GEORGE WINTER AND OTHERS.]

Caledonian Railway Route Indications.

We cannot spare the space to give a list of the routes indicated by the chimney

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semaphores by day, and the lamps at the cab sides by night, on the Caledonian Railway, but we may be able to find room for an article on the subject at a future date.

[Reply to LIEUT. W. A. C. MCCONNEN.]

Dean's 4-6-0 Goods Engines, Great Western Railway.

So far as we are aware, none of the 4–6–0 goods engines with outside frames and inside cylinders, designed by Mr. William Dean, are now in service, although we believe a number of the corresponding 2–6–0 engines to be still at work.

[Reply to J. S. SEARLS.]

Crossheads.

The term "cross-head" probably originated with the earliest types of steam engine, and at a period well before that of the first locomotive. It may possibly have been derived from the literal "cross head" of Watt's beam engine.

[Reply to E. N. PATE.]

Dublin and South Eastern Railway 2-4-0 Tank Engines.

The Dublin and South Eastern Railway owns twelve 2–4–0 tank engines. If you read the heading of these pages you will see that we do not undertake to give locomotive numbers.

[Reply to "TRAVELLER."]

Locomotives of the London, Brighton and South Coast Railway.

We know of no book which will give you the names and numbers of all the engines on the London, Brighton and South Coast Railway. Obviously we have not the space to do so here.

[Reply to M. A. BANNISTER.]

Glasgow and South Western Railway.

Chairman and General Manager of the Glasgow and South Western Railway during 1891 and 1892 were respectively Sir Renny Watson and Mr. John Morton.

[Reply to JAMES WOTHERSPOON.]

"Claughton" Class 4-6-0 Engines, London and North Western Railway.

No. 2222, *Sir Gilbert Claughton*, the pioneer engine of this type, was turned out of Crewe Works in January, 1913.

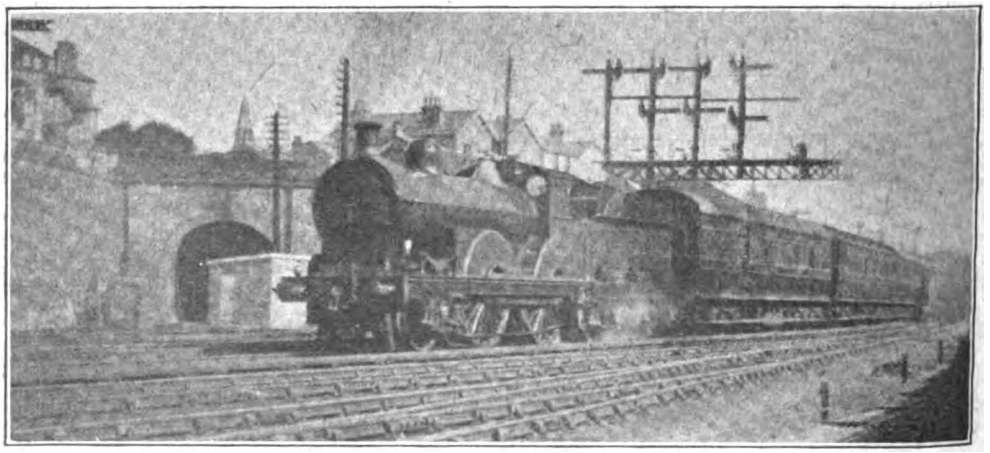
[Reply to E. N. PATE.]

No. 251, 4-4-2 Type, Great Northern Railway.

No. 251, the pioneer large-boilered "Atlantic" express engine on the Great Northern Railway, has not been superheated.

[Reply to K. PATON.]

NORTH EASTERN RAILWAY.



Photo] [Norman North-Smith.

LEEDS TRAIN LEAVING SCARBOROUGH.
2–4–0 rebuilt locomotive, No. 167.

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THE RAILWAY PORTRAIT GALLERY.

HUGH. W. DRUMMOND,
Hon. Brigadier-General,
Chairman of the London & South Western Railway.

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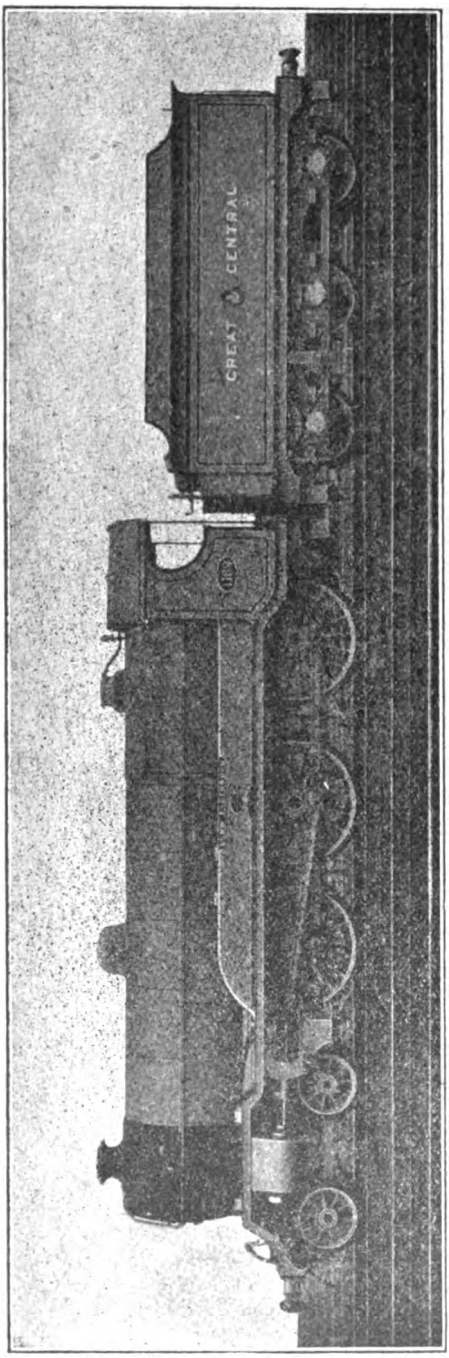
New Four-Cylinder Express Locomotive.

IN Mr. Cecil J. Allen's current instalment of "British Locomotive Practice and Performance" reference is made to the new locomotive illustrated on this page. This is the first example of a four-cylinder locomotive on the Great Central Railway and we hope in due time Mr. Allen will be able to record its performances.



GREAT CENTRAL RAILWAY ENGINE, NO. 1169, *Lord Faringdon*. Fitted with the Robinson Superheater.

As is well known the 4–6–0 type has long been favoured by Mr. J. G. Robinson, Chief Mechanical Engineer of the Great Central Railway, not only for fast goods and perishable traffic, but for the heaviest passenger, parcel and mail trains, in order to adequately cope with the heavy loads and fast timing required over a main line having a ruling gradient over its "easy" part of 1 in 176, with long banks of 1 in 120 or less in the other portions.

We append a few of the leading dimensions of the engine, which bears the number 1169, and is named *Lord Faringdon*, after the chairman of the company:—

Cylinders (four), diameter	16 in.
Piston stroke	26 in.
Wheels, coupled, diameter	6 ft. 9 in.
„ bogie, diameter	3 ft. 6 in.
Wheelbase, rigid	15 ft. 6 in.
„ engine, total	28 ft. 10 in.
„ „ and tender	52 ft. 9¼ in.
Boiler, length of barrel	17 ft. 3 in.
„ diameter, outside	5 ft. 3¼ in. and 5 ft. 6 in.
„ height of centre from rail	8 ft. 11 in.
Heating surface, fire tubes	1,881 sq. ft.
„ „ firebox	159 sq. ft.
Superheater elements (28)	343 sq. ft.
Heating surface, total	2,383 sq. ft.
Grate area	26 sq. ft.
Working pressure	180 lbs.
Weights, in working order—	
On leading bogie	20 tons 15 cwt.
On leading coupled wheels	19 tons 10 cwt.
On intermediate coupled wheels	19 tons 10 cwt.
On trailing coupled wheels	18 tons 3 cwt.
Total	77 tons 18 cwt.
Of tender in working order	48 tons 6 cwt.
Of engine and tender in working order	126 tons 4 cwt.
Tractive effort at 90 per cent. boiler pressure	26,230 lbs.
Tractive effort at 85 per cent. boiler pressure	24,772 lbs.
Tractive effort at 80 per cent. boiler pressure	23,315 lbs.
Adhesion factor (fully loaded) at 90 per cent.	4·86
Adhesion factor (fully loaded) at 85 per cent.	5·17
Adhesion factor (fully loaded) at 80 per cent.	5·50

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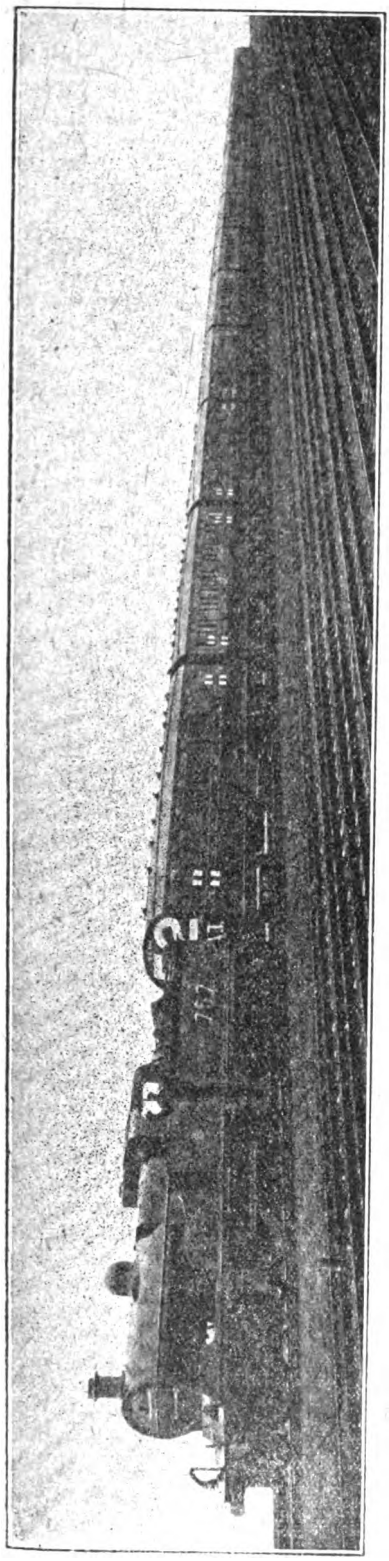

NEW AMBULANCE TRAIN, NO. 52, BUILT BY THE MIDLAND RAILWAY FOR THE AMERICAN EXPEDITIONARY FORCE.

New Ambulance Train, No. 52.

Built by the Midland Railway Company for Service with the American Expeditionary Forces.

AT their Carriage and Wagon Works, Derby, the Midland Railway Company have just completed a new ambulance train for the use of the American Expeditionary Forces.

The complete train consists of sixteen cars, with accommodation for about 130 persons. Each car is 54 ft. long, mounted on four-wheeled bogies, and equipped with Westinghouse brake. The couplings, draw-hooks, steam connections, and side chains are to the international standard.

Total length of train, without engine and tender, 913 ft.; weight (unloaded), 435 tons.

Each car is built of well-seasoned timber, and painted "khaki" colour, without any relief save two large red crosses on white ground on either side. For identification purposes, the number of each car and the distinguishing letter are conspicuous on each side, and the train number is painted on the extreme ends of the train.

The train is vestibuled, and fitted throughout with electric light and fans. All roofs are semi-elliptical, with lofty and airy ceilings. Every care has been taken to admit of the interior of the cars being kept clean with the least effort. The floors are covered with linoleum or lead, and have rounded corners.

The gangways between the cots are wide enough to pass the Army stretcher.

An abundant supply of water (2,835 gallons), apart from the drinking water, is carried in tanks built in the roof.

In addition to the equipment for warming the train, by steam from the engine, the "Staff" car B and the "Personnel" car C have each a separate, self-contained circulating hot water apparatus for use when the engine is not attached.

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On the train the cars are in the following order :—

A.10—Brake and "lying" infectious ward car.
B—Staff car.
D.1—Kitchen car (with officers' compartment).
A.1, A.2, A.3, A.4—Ward cars (four).
F—Pharmacy car.
A.5, A.6, A.7, A.8, A.9—Ward cars (five).
D.2—Kitchen car (with N.C.O.'s and men's compartment).
C—Personnel car.
E—Brake and stores car.

Car A.10 contains four wards, each fitted with six beds; and attendant's compartment with lavatory and toilet accommodation, also guard's compartment with bed, folding table and seat, lavatory, etc., in addition to the usual brake equipment.

Staff car B contains dining room and sleeping compartments for the medical officers and sisters, and lavatory and toilet accommodation, including side sprays. This car is also furnished with wardrobes, cabinets and book racks, and is finished and panelled throughout in polished mahogany.

Kitchen car D.1 contains an officers' pantry and cook's room, with three sleeping berths, dining table, seats, etc. The kitchen, which is a spacious compartment, is "fitted with" an Army "Dixie" range with hot water supply, also a "Sover" stove. A comfortably furnished "sitting" sick officers' compartment forms part of the kitchen car, having wood linings and tables of polished mahogany, and the seat coverings of moquette, with a lavatory compartment adjoining. A bath room is also provided in this car, containing a 4 ft. 6 in. bath, fitted with hot and cold water and shower bath.

The nine ward cars are open throughout, with a lavatory compartment at one end. Each car contains 36 folding cots, in three tiers, the cots in the middle tier being so arranged that they can be folded down to form backs for "sitting" cases on the lower tier.

An ample supply of drinking water and conveniences, such as paper racks, ash trays, etc., are provided for each patient.

The sides and roofs of these cars are painted in glossy white enamel.

Pharmacy car F comprises a dispensary and treatment room, medical officer's office, linen room, and a pantry for medical comforts, also an emergency compartment. The corridor on this car is wide enough to freely pass a stretcher into the treatment room. The dispensary is fitted with cupboards and racks for bottles, surgical dressings, etc. Part of this car is partitioned off and provided with 8 berths, in which "bad" cases can be treated.

Kitchen and men's mess car D.2 contains large kit store, wash basin, and kitchen similar to that on car D.1, mess room, with folding table, for the men, and a smaller mess for the N.C.O.'s, the latter having two beds, so that the senior N.C.O.'s may sleep there if desired.

Personnel car C is arranged similarly to the ward cars, except that the mattresses of the beds are covered with American cloth, so that the beds can be used as seats by the staff during the day. Kit racks are provided, and also small lockers under the beds.

Brake and store car E contains a large linen store and a compartment provided with shelves for carrying the general provisions required on the train, also kit store and compartment for perishables, and a meat safe. A brake compartment similar to that on car A.10 completes the vehicle.

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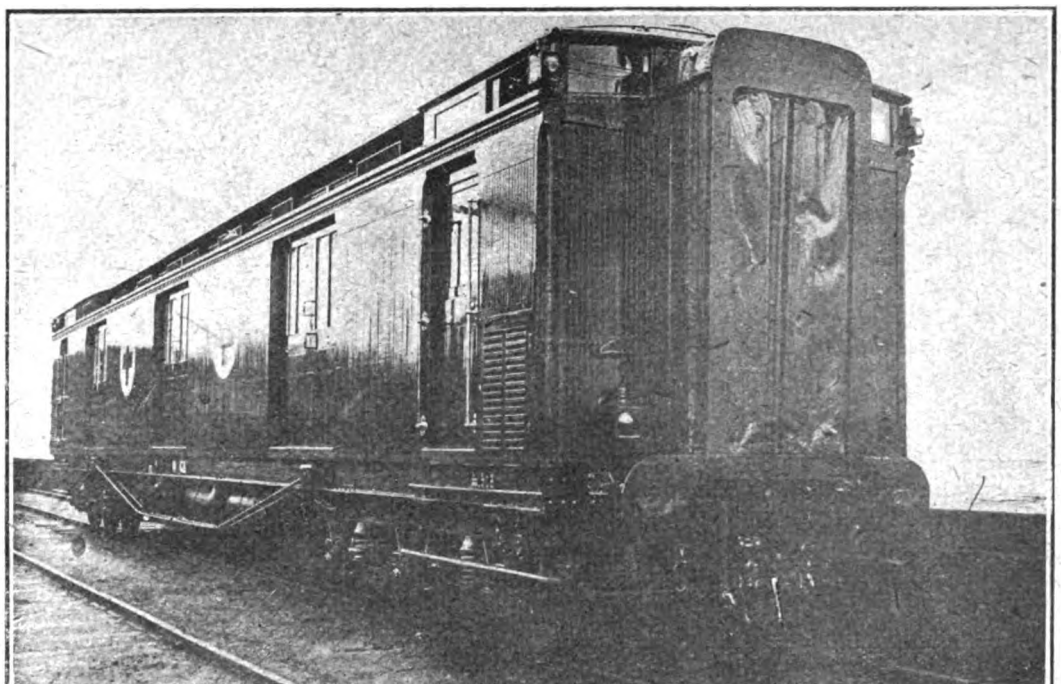
AN AUSTRALIAN RAILWAY HOSPITAL CAR.



For the conveyance by rail of invalid and wounded soldiers between Melbourne and Albury, one of the Victorian Railways 60 ft. vestibule express vans has been converted into a hospital car, as here illustrated. Provision is made for the accommodation of twelve patients (non-infectious cases) in one ward, and for four patients (infectious cases) in the other ward.

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Fleetwood and the Nation's Fish Supply.

RECOGNITION OF LANCASHIRE AND YORKSHIRE RAILWAY ENTERPRISE.

IN the RAILWAY MAGAZINE the possibilities of Fleetwood as a port and the importance of the developments by the Lancashire and Yorkshire Railway at the Wyre Docks have more than once been emphasised. As long ago as December, 1909, an illustrated article was included dealing with the port of Fleetwood, and similar attention was given the Wyre Dock in June, 1915. The claims of the port have now received recognition much further afield, and recently Sir Edward P. Morris, Premier of Newfoundland, paid it a visit of inspection.

VISIT OF SIR EDWARD MORRIS TO WYRE DOCKS.

Sir Edward Morris (centre), Sir John Aspinall (left), Miss M. I. Aspinall, and Mr. H. Marriott and party.

Sir Edward Morris arrived on the quay in a special train, accompanied by Sir John Aspinall, General Manager of the Lancashire and Yorkshire Railway, Mr. H. Marriott, Chief Goods Manager, and other officials of the company. Proceeding to an enclosure on the quayside, Sir Edward addressed the assembly on the special object of his visit.

Sir John Aspinall said:—I want to introduce to you Sir Edward Morris, the Premier of Newfoundland. Sir Edward Morris has been good enough to come down here, at our invitation, in order to see how the port of Fleetwood is situated for the importation of fish from Newfoundland. He is deeply interested in everything connected with the fishing industry, and he will tell you how anxious he is to see every facility given to the importation of fish from his country into this port of Fleetwood. Having said that I will now ask Sir Edward to address you, and then, as soon as he has finished, I will ask you to show him everything you can in the limited area now covered with fish. I have assured him that if we were in peace instead of in war the whole of this area would be covered with fish from end to end.

Sir Edward Morris:—Sir John Aspinall, and citizens of Fleetwood. I am under a very great debt of gratitude to Sir John Aspinall and the

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directors of his company, and to Mr. Marriott, for all their courtesy and kindness shown me for the last three or four days during my visit to Blackpool and Fleetwood. I am doing to-day what I have longed to do for many years, namely, seeing the wonderful things you have accomplished and that you are destined to accomplish. As Sir John has told you, I am particularly interested in a matter that has a bearing on the fishing industry, not alone the catching and consumption of the fish, but in the various ways adopted here and in other places for the putting up of that article in the most attractive way for the consumer. Now, of course, after the war is over it is, I hope, going to be the policy of the Empire, in order to keep our own people at home fully employed and well paid, to try to utilise the great natural resources and raw materials of the Empire. That principle involves, of course, so many questions that it would take one all day even to touch upon the various heads.

Take Newfoundland as a sample. We buy all we require, nearly, in the Empire. All the things we require, all the clothes we need, we come to England for, and we sell none of our fish in that Empire. We sell all our fish salted. We make it hard cured and we send it to Greece, Italy, Spain, Portugal, and Brazil. Then we take the gold we get from those countries, and we come here and buy in Manchester, Birmingham, Glasgow, Liverpool, and the other great trading centres where the people manufacture in this country.

Now, if we can make the Empire more self-supporting than it is by disposing of our fish within the Empire, then there is a very laudable and attractive policy for the Empire to take up after the war. Some people may say, "Ah, well, but what about the fishermen in England? What about the fishermen in Fleetwood? What about the fishermen in Grimsby? If you bring your fish to England what is going to happen to them when they will be knocked out of business?" It was the same argument that was used last year in relation to cotton in India by our Lancashire spinners.

Well, now, let me tell you right away that there is nothing whatever in that argument. It only wants to be mentioned in order to be refuted. In the first place, if we were to bring over our whole catch—the catch of our biggest year, which was last year, 180,000,000 lbs. of fish—it would be only 2 lbs. of fish a year for the whole of the people of England. Two pounds of fish a year is not likely to interfere with the fishing industry of England.

When you take into consideration the amount of labour, the amount of additional labour required here, in order to handle that freight, bringing it over, and the various industries that would be set up in connection with the distribution and disposal of the fish, there would be very good results from the development of such an industry. But there is another and a more potent and more convincing argument. No one believes to-day that we are ever going back to the pre-war days as regards the consumption of fish. Fish is the best food that can be obtained. It is a good, substantial food for the working man, for the man who works in the docks. You ask the fishermen themselves and the men who work on the fish quays if they would not as soon have good fresh cod or a good herring, either salt or fresh, as they would meat. Of course, they would not like to have it every meal or every day. The brain worker, the man who is engaged in clerical work, the man who leads a sedentary life, the man without the opportunity of open-air exercise gets a food easily digested. And so I think it is safe to say that after the war the consumption of fish in this country and in other parts of the Empire will not alone be doubled, but will be quadrupled. It is not alone a good food, a substantial, strong food, but it is the best food you can eat, because it is easily digested and there is no tuberculosis in it.

Well, now, it is from that standpoint that we are interested in Newfoundland. Up to to-day we have never sold a pound of our fish fresh.

We have salted it, and hard cured it for the Mediterranean markets generally. Italy, Greece, Spain, Portugal, and the Brazils and South America, they take all our fish. Whilst I am speaking our first cargo of fresh fish is on its way to England. It is only an experiment, but I hope it will prove a success, because if it does we will be able to give the people of England a cheap food and a good food, and we will be able to do it without in any way interfering with the trade of the country.

Of course, such an industry would not stop here, because if it becomes a success steamers will have to be built to bring the fish over here, stores to contain it, larger railway equipment will be required to handle it, and ice and salt will be required. And then we will have these steamers to bring back the goods from this country, thus giving to the people of this country who are now looking for it more work, and a class of work that will give higher wages.

There is only one way by which we can survive the heavy taxation which is bound to follow on this war, and that is by increasing the productivity of the whole Empire, by increasing the wage of the labouring man. Otherwise, where is the money to come from to pay the taxation following on this war? And that is a very important thing for every one of us to look to. Even if this war ended to-morrow the taxation of England would be more than double what it was when war was declared; and to meet that taxation we shall require more labour and better pay for our people. It is in this way that you can pay your taxes. And remember the greatest tax of all is want of employment.

A man never minds paying a little tax of a dollar a year, or two or four dollars, or even ten dollars a year, if he is given an opportunity of earning the money to pay it with. It is idleness, lack of employment, and the lack of proper remuneration for his labour that makes it difficult. These are really the reasons that I am interested in coming here this morning. I hope that after the day is over, when I shall have an opportunity of visiting the various auxiliary

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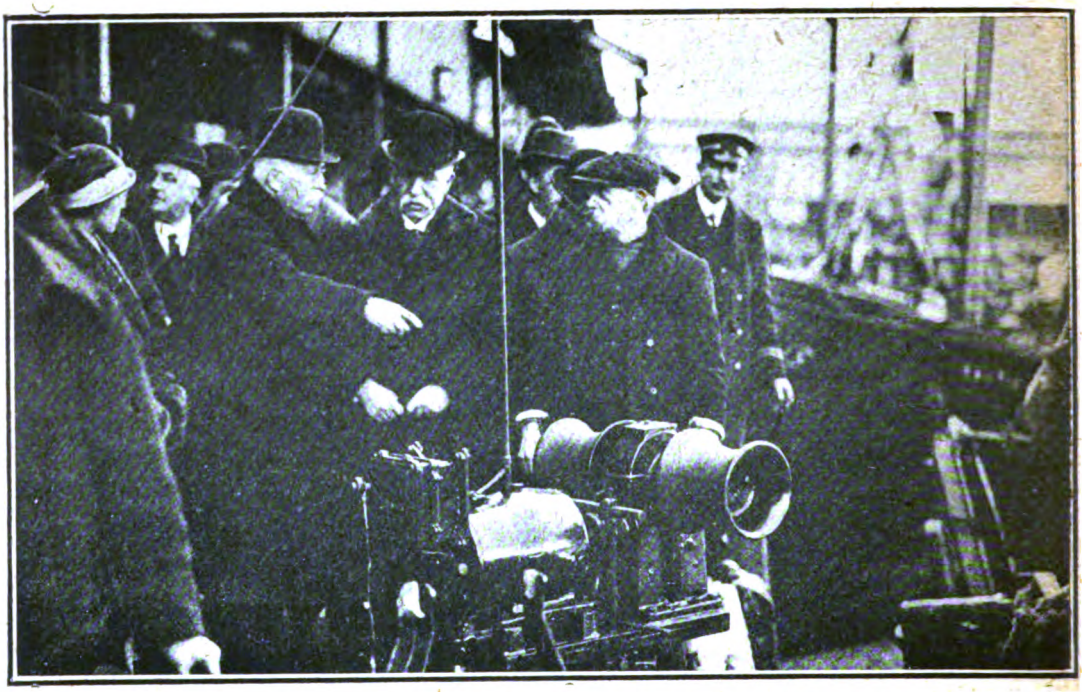

SIR JOHN ASPINALL (LEFT) AND SIR EDWARD MORRIS INSPECTING THE EQUIPMENT OF THE DOCKS.

industries here in connection with the fish trade, that I will be able to see the salt works; because here again is an illustration of what can be done in the way of work within the Empire. All the salt we require in Newfoundland we bring over from Cadiz. We take our gold and we go over to Spain and buy salt. There is no reason why that salt should not be bought here. Up to the present time, for some unaccountable reason, we have been able to buy salt cheaper in Spain and more suitable for the keeping of Newfoundland fish. You have only got to examine the figures to see what can be accomplished.

Look at Fleetwood to-day. It is within the memory of many people I am addressing when it was a straggling village. Yet see what can be accomplished by money and brains. It may not be putting it too high to say we see before us to-day the beginnings of another Liverpool, or another great industrial centre which will, as the years go on, develop into a great wealth-producing centre for both capital and labour. If the thing is to be a success, capital and labour will have to be united. The day is past when there can be any disagreement between capital and labour, because both are necessary in the production of wealth. You can do nothing without the combination; gold can do nothing without labour, and labour can do nothing without gold. The thing will be after the war to so convince the labouring man, the mechanical man, the man with a family, who is really the bone and sinew of the country—to convince him that he is getting every dollar out of his labour and every dollar that the industry will bear. I am very grateful to you for coming here this morning, and I am very thankful for the patient hearing you have given me. I hope some day to come back again, when a connection has been established between Fleetwood and Newfoundland, and to be able to tell you something of the advantages of the new connection.

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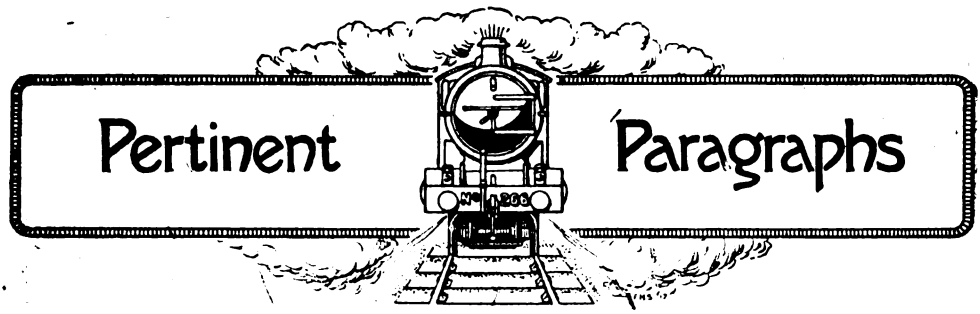

Our Colour Plate.

UNDOUBTEDLY one of the most famous of all British express locomotive types is that represented in our coloured plate in the present issue —one of the 4-cylinder 4–6–0 express engines which handle the fastest and heaviest expresses on the Great Western Railway. The locomotive in question, No. 4041, *Prince of Wales*, was the first of a new series in which the diameter of the four cylinders was increased from 14½ to 15 in. Of the "Princes" 5 were built, and these have been followed by 15 "Princesses," making up a total, with 10 "Kings," 10 "Queens," 10 "Knights" and 11 "Stars," of 61 engines nominally included in the 4-cylinder "Star" class. The 2-cylinder 4–6–0's consist of 25 "Courts," 20 "Saints," 10 "Ladies," and 22 earlier engines (a number of which were converted from "Atlantics"), total 77 engines, classed as "Saints." There are, therefore, 138 4–6–0 express engines of modern type in service on the Great Western Railway. Our plate shows the latest Great Western locomotive colour scheme, in which the safety-valve is painted over, and the chimney becomes "all-black" in character. This has now definitely replaced the khaki tint which was tried for some time, at any rate so far as express engines are concerned.

The Railway Club.

THIS society, founded in 1899 for the purpose of bringing together those who are concerned both professionally and generally in the practical working of railways, held its annual meeting, under the presidency of Mr. W. Parker, at the club-house, 92, Victoria Street, London, S.W.1, on Tuesday evening, January 8th.

The annual report and statement of accounts presented to the meeting indicated progress in spite of the abnormality of the present times, twice as many new members having been elected during 1917 as were admitted in 1916. The report and accounts having been adopted, the meeting confirmed the election of Mr. Alasdair Maclean, the first new member for 1918. With much regret the committee announced the death on the field of battle of another member—Lieutenant B. J. Hubbard, of the Grenadier Guards.

At the monthly general meeting of members at 7 p.m. on Tuesday, February 12th, Mr. H. L. Hopwood, of the Great Northern Railway, and a frequent contributor to the RAILWAY MAGAZINE, is to present a paper entitled "Early London Railways." Non-members who desire to attend should write to the hon. secretary, Mr. E. J. Miller, enclosing a stamped and addressed envelope.

An Historical Tramway.

AT a recent meeting of the corporate body of Stratford-upon-Avon, the Town Clerk stated that he had received the following letter from Mr. A. W. Bolter on behalf of the Great Western Railway: "'In consequence of the urgent requirements of the Government at the present time for materials which can be utilised in connection with the production of munitions of war, an arrangement has been come to for the removal, on their behalf, of the permanent way materials of this Company's tramway between Stratford-upon-Avon and Longdon Road. At certain points the tramway crosses and for certain distances runs alongside public roads in which your Council is interested, and I am giving you this intimation so that it may be understood that the removal of the materials is a temporary measure, and is in no sense to be regarded as indicating any intention to abandon the tramway, and that the Company reserve the right to restore the same at any time hereafter if and when they should require to do so."

Commenting upon the foregoing, Mr. T. R. Perkins writes from Henley-in-Arden, "I am very sorry to read this. As I said in the RAILWAY MAGAZINE for October, 1902, page 302, the line between Stratford and Moreton-in-the-Marsh was opened in 1826, the portion now proposed to be taken up having been long disused, and still possessing the original permanent way, viz., fish-bellied rails laid in chairs on stone blocks. The fact that the line was made under the auspices of Mr. William James, the 'Father of Railways,' who was born in this town, gives it additional local interest. Of course these old relics will just be melted up for munitions. On the Lapworth branch the manhole covers of the drains were made from pieces of Barlow rails—they too have gone just lately! I wonder if any specimens of those rails are in museums: the bridge rails are used about here for supports to fencing of our present line."

High-Speed Railways after the War.

BEFORE a meeting of The Society of Engineers (Inc.) Mr. Chalmers Kearney recently read a paper, illustrated with lantern slides on High-Speed Railways for construction after the war.

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After pointing out that rapid transit for passengers and goods was of paramount importance in the economic life of a nation he set out what must be regarded as the essentials of a successful high-speed railway system :—

It must eliminate oscillation ;

It must allow of the use of simple points and crossings ;

It must be reasonably cheap to construct ;

It should be capable of being built coincident with existing lines, and through existing tunnels ;

It should be capable of being used as a surface, elevated, or tube railway ;

It should not depend for the stability of its cars on moving mechanisms (such as gyroscopes) ;

It should not concentrate the stresses due to centrifugal force and side wind pressure on one rail.

The existing lines as well as various systems proposed by inventors from time to time do not fulfil all these requirements, and it was to solve the problem presented and meet these points that the Kearney high-speed railway was designed. Details of track construction were given and the ample margin for safety illustrated. For practical purposes Kearney high-speed trains will be secure from derailment under all conditions. Pictures of the first full size passenger carrying car were exhibited. The car is "streamlined" to reduce air resistance at high-speeds and ball bearings of an improved type are used. As is well known the Kearney system employs a single rail to carry the weight of the trains and a second overhead guide rail to maintain equilibrium. The mechanical advantages of this method were fully described by the author. Simplicity in design has been achieved and the cost of the overhead structure is actually less than in the case of that for the electric transmission wires on the Brighton Elevated Electric. Future Kearney lines would cost much less to build on account of the steeper gradients which may be employed which will permit of large reductions in embankments, cuttings and tunnels. Bridges would also cost much less owing to the concentration of the load on to one deep plate girder.

As regards working, Mr. Kearney considered that speeds of 100 to 150 miles an hour would be economically sound with this system and showed how operating costs would be reduced. The abolition of oscillation and consequent concussion would greatly reduce the cost of upkeep of the tracks. In short, high-speed railways would not merely prove to be an economic advantage but a commercial necessity in the era after the war.

Speaking of underground railways, Mr. Kearney said that present methods left much to be desired. The four points for consideration in the construction of future underground lines were :—

To secure more convenient stations ;
To reduce capital expenditure ;
To obtain higher speeds ;
To reduce operating costs.

The London Tubes were phenomenally slow owing to the lifts. They were also extremely expensive to build and to work. The Kearney system removed these disadvantages and secured all requirements. A recent improvement in the Kearney system is the design of a "Stepless" street level station. An intending passenger would step off the pavement on to the platform and into the train. The train would then descend a gradient of 1 in 7 to a depth of 110 feet, so that a speed of 60 miles an hour would be reached in 23 seconds from the start. The train would then proceed on a level until the approach to the next station when it would run up a similar gradient which would bring it to a standstill without the destructive use of brakes. Such lines besides being vastly more convenient for passengers permit of train-speeds at least twice as great as on the present tubes. This means a corresponding reduction in the number of trains employed, reduced staff, lower working costs, higher wages and lower fares. The ventilation of such lines would be automatic and practically perfect.

Railway Tunnels under the City of Buenos Aires.

MANY RAILWAY MAGAZINE readers will be interested in the following abstract of a paper entitled "Buenos Aires Western Railway Tunnels under the City of Buenos Aires," read by Mr. William Lowe Lowe Brown, M.Sc., M.Inst.C.E., at a recent meeting at the Institution of Civil Engineers.

The works described are :—

(*a*) A concrete-lined single-line tunnel about three miles long, giving the Railway a direct connection for Goods traffic only between their main line and the Port.

(*b*) A double-line tunnel, about two-thirds of a mile long, to bring the suburban passengers into an underground interchange station, in which they can conveniently change to the trains of an underground line running into the heart of the city.

The Paper gives a short description of the City of Buenos Aires and of the traffic of the Western Railway, and then explains that the railway had no connection of its own with the port, and had in consequence to send all goods consigned there over other railways, at a cost of about £35,000 a year.

As a tunnel access to the port would pass through the heart of the city, and as the existing passenger terminus was not conveniently situated for the suburban passengers, it was natural to consider improving the facilities for this service at the same time.

A short history of the present project is next given. Originally it had been proposed to build a double-line tunnel to the port to be used for both the goods and passenger service, with passenger stations at suitable points on the route ; but the idea was afterwards changed for various reasons, principally because the Tramway Company obtained a concession for an underground line which followed the same route

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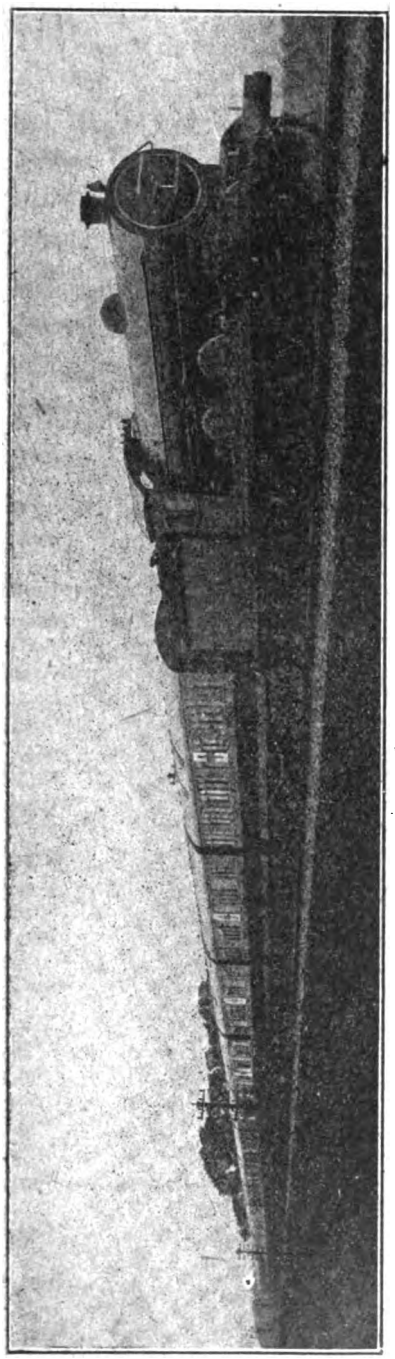
and could be built under more favourable conditions. It was, therefore, decided to build only a single-line tunnel to the port exclusively for the goods service, and to construct jointly with the Tramway Company an underground interchange station on the Tramway Company's underground line into the heart of the city, with a short double-line tunnel connecting it to the Railway Company's main line.



AMBULANCE TRAIN FOR OVERSEAS, BUILT BY THE NORTH EASTERN RAILWAY.

The route taken by the tunnels and the layout of the interchange station are next described; the different types of station considered are discussed in relation to the probable traffic, which although only about 5,000,000 passengers per annum at the time the studies were commenced, was expected to increase to about 20,000,000 within a very few years of opening the service.

In the adopted scheme for the interchange station the railway company's tracks occupy the middle position in the station, and are separated from the Tramway Company's by two wide island platforms, one on each side. The passengers change trains by simply walking across these platforms.

Before describing the design of the tunnel lining, a description of the extremely favourable nature of the subsoil for tunnelling is given, and the steps taken to prove its reliability and continuity are explained: the ground is a sort of clayey marl, but does not appear to have any of the treacherous qualities of clay or marl; in fact, it is more like soft rock than anything else, as it will stand untimbered for a long time without any sign of movement. The underground obstructions to be met with are next described: they consisted not only of sewers, etc., crossing the route, but also of the Tramway Company's underground line, which was to be constructed at the same time almost immediately above the goods tunnel for the greater part of its length, and was at most points actually constructed before the tunnel.

The adopted design for the goods tunnel is a horse-shoe-shaped mass-concrete lining, 1 ft. 8 in. thick, large enough to accommodate the standard Argentine broad-gauge (5 ft. 6 in.) railway, the construction gauge of which is cast-iron lining was considered, but was 15 ft. 10 ins. high and 13 ft. 9 in. wide. A rejected on account of cost. The design for the passenger tunnel was also a mass-concrete lining, but for a double line.

In describing the construction, the positions of the working-shafts are explained, and the general plant at each working-site is described. Owing to the design, very simple methods of construction were possible, and the plant was of the simplest nature; all the excavations and concreting were done by hand. The general sequence of operation is explained by means of sketches. Very little timbering was necessary, the contractors taking advantage of the good ground by working in much longer lengths than was originally contemplated.

The Story of the Midland Railway.

THERE was an excellent attendance at a recent meeting at Henley-in-Arden when T. R. Perkins, a frequent contributor to the RAILWAY MAGAZINE, gave a lecture on "The Story of the Midland Railway."

As an introduction to his subject, the lecturer pictured the difficulties of travel in the "good

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old times," and read some amusing accounts of journeys undertaken some 150 to 200 years ago. As recently as the early part of the 18th century the journey between London and Edinburgh occupied ten days in summer and twelve in winter, and the roads were so execrable that the ruts were often four feet deep! Proceeding, the rise of the railway system was briefly touched upon, and the fascinating history of the great undertaking, which still modestly calls itself "Midland," but whose lines now stretch from Carlisle to Bournemouth and from Lowestoft to Swansea, with its more than 2,000 miles of railway and its capital of £200,000,000, was traced from its humble beginnings as a tiny colliery line in Leicestershire.

Originally a purely Midland undertaking, with its southern termini at Hampton-in-Arden and Rugby, the lecturer described how the system was gradually extended to Bristol, Hitchin, and (finally) London in the south, and northward to Bradford, Lancaster and Carlisle. To the last-named city, which was reached in 1876, the Midland Railway had to force its way through most difficult country, and the line thither is one of the wonders of railway engineering, as is also that through the Peak district to Manchester.

The Lickey incline, near Bromsgrove, came in for description as an interesting engineering work, and the wonders of St. Pancras station in London were briefly noticed. As the pioneer in railway reform, notably by its introduction of comfortable third-class carriages when bare boards were the rule elsewhere, and its admission in 1872 of penny-a-mile passengers to all trains, the Company received warm commendation. The glorious scenery traversed by the Manchester and the Settle-Carlisle sections was also mentioned, and the lecture was followed with much pleasure by all present.

Railway Law and Police.

AT an Efficiency Meeting held at the L.G.O.C. Training School, Milman's Street, Chelsea, Mr. H. E. Blain, Operating Manager, in the chair, two papers "Railway Law and Police" were read by Mr. H. Newman, Chief Clerk of the Police Section of the Office of the Superintendent of the Line, and Mr. H. J. Smithson, Chief Enquiry Inspector, District Railway, to an audience of nearly 200 of the Control Staffs.

The authors dealt with the obligations which rest upon railways with regard to the safe carrying of passengers, such interesting cases as Atherton *v.* London and North Western Railway (injury from an engine spark), and Cobb *v.* Great Western Railway (robbing in a train), being quoted, together with the question of liability under Lord Campbell's Act, 1846, which was limited to the actual pecuniary loss sustained.

Obligations in connection with the provision of smoking carriages, workmen's trains, and passengers' luggage were also discussed, it being a curious factor that railways are insurers of the safe carriage of luggage when placed in their charge, whereas their responsibility for passengers' safety is limited to negligence.

In connection with cloak room accommodation, it is not generally known to the public that railways are not, in this connection, common carriers, but act as warehousemen, and the customary condition limiting their liability to a certain sum has been upheld in Courts, unless any higher value has been declared and an increased charge paid.

Railways are compelled to exhibit fare boards, and to maintain mile stone posters with the distance inscribed thereon; failure to do either, precluding them from charging tolls.

Powers for the protection of railway companies were frequently obtained in bye-laws, and both authors from their long experience made a number of useful suggestions for their improvement.

Examples of the curious fascination of fraudulent travelling were given, and improvements in the method of detection suggested.

Railway Discipline.

FINES form a very important feature of the disciplinary system on Indian railways, and combined with them is a procedure of appeals which takes up a considerable portion of the district traffic officer's time. Mr. W. T. Aldous, Assistant Traffic Superintendent, Bombay, Baroda and Central India Railway, who has had practical experience of British and Canadian railway methods, has come to the conclusion that the "Browne" system of discipline, entailing the award of merit and demerit marks, is not only preferable to the levying of fines, but also more suitable to Indian conditions, and he sets out his reasons in an interesting paper entitled "The Advantages and Disadvantages of the Mark or Browne System of Maintaining Discipline on Railways as compared with the Fine System." The paper gained a silver medal in an Indian Railway prize competition.

The system of levying fines, as it is practised in India, has, according to Mr. Aldous, two distinct disadvantages. One is that an employee may be fined over and over again without any resulting improvement in his work or behaviour, so that as a disciplinary measure fining tends to defeat its own ends. "In fact, dismissal simply on the strength of a bad record is almost unknown." The second objection is that fines, by involving an employee in a certain discomfort, and possibly causing him to run into debt, tend neither to improve his work nor to make him desirous of doing better work in the future. Here, again, the very essence of discipline is defeated.

Now compare this with the results of a system where discipline is enforced by means of a record of merit and demerit marks. Suppose the maximum number of demerit marks which an employee can obtain is 60, as is the practice on the Canadian Pacific. A man may have 59 marks against him without any disciplinary action being taken, but he knows that one more

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mark automatically means dismissal, without appeal or possibility of reinstatement. Obviously, we have here a system providing incomparably more of a deterrent influence than fines repeated *ad infinitum*. But the deterrent factor represents only one side of the "Browne" system. The other side is the influence of merit marks.

The award of merit marks operates in two ways. An employee's keenness is stimulated and accentuated when he knows that a meritorious action will be recognised and permanently inscribed on his service record, which makes for good work quite irrespective of the question of good discipline. But, apart from this aspect, the practice of awarding merit marks has this outstanding advantage—that it not only enables an employee to redeem a bad record as the result of merit marks being set off in reduction of demerit marks, but is, perhaps, the only system of discipline hitherto adopted whereby a previous bad record may automatically be lessened, or even wiped out. And—a point often overlooked—the merit mark exerts quite as much of a positive disciplinary influence as the demerit mark.

Reference has already been made to the Indian system of appeals, which take up so much of an officer's time. Such a procedure goes hand in hand with a system under which fines can repeatedly be inflicted for the same offence or mistake, whose further commission is quite unlikely to lead to dismissal. As the operation of the "Browne" system means the automatic dismissal of employees against whom there is recorded a specified number of demerit marks, and as there is no appeal against such dismissal, it is obvious that the system reduces the waste of time involved in hearing appeals.

We may add, in conclusion, that although Mr. Aldous is a whole-hearted advocate of the adoption of the "Browne" system on the Indian railways, he expressly excludes the menial or labourer at all from its operation. These employees, he considers, can only be disciplined successfully by means of a system of fines.

Influences on Locomotive Design.

MR. HEWITT, of Bath, has forwarded the following reflections on the probable influence of possible nationalisation of railways on British locomotive designs suggested by the announcement in the January RAILWAY MAGAZINE that the large "Baltic" tank engines acquired by the Midland Railway from the London, Tilbury and Southend line or in corporation are piloted in all cases. The Midland, he remarks, is recognised by all students of locomotive operation as a line which regularly and systematically adheres to the practice of "double-heading," but even in these circumstances the information is of moment. When the "Southend Baltics" were first introduced, surprise was expressed in certain well-informed quarters that such mammoths had been found necessary. Now, apparently, their present owners consider them "white elephants." Interest is added to the position, when we remember that on the Brighton line Mr. Billinton has lately multiplied his "Baltic" type. The issue of an official statement would readily clear up the mystery. Meanwhile, the position recalls an older contrast in departmental methods—the disappearance of the Great Western 4-2-2 locomotives, while their Midland counterparts were retained in service. The conclusion of these reflections is all too obvious—that a unity of control would lead either to a greater reduction in the number of "standard" types, or to the re-classification and retention on suitable duties of older engines, in preference to demolition. And in practice a combination of both systems would probably prevail.

Great Western Railway Wagon Nomenclature.

As is well known, the Great Western Railway employs a system of class-names for special types of goods wagons. These are painted on each vehicle, and used for code purposes. The realm of natural history (including botany) supplies the source for the majority of these names, which have much picturesque suggestiveness. Of all these type-names, that of "Crocodile," applied to bogie well wagons, is probably the most familiar. Other examples from the recognised animal kingdom are "Macaw" and "Serpent." "Pollen" brings us into the realms of botany. Most interesting are the examples of mythological names. "Hydra" certainly denotes a species of water-snake, as well as the fabulous many-headed monster; but "Loriot" presents something of a puzzle. It suggests at first sight an association with the vehicle called a lorry. But research in an eighteenth century dictionary furnishes a surprising solution. A Loriot, says this authority, is "a Bird, that, being look'd upon, by one that has the yellow Jaundice, cures the Person, and dies itself." Unfortunately, the lexicographer omitted to state the habitat of this wonderful bird, or—which would make still more wonderful reading—the means adopted for its capture. "Mica" is applied to this Company's meat-vans, and the bogie parcel vans are known as "Monsters"—quite appropriately. Other vehicles of similar type are called "Siphons."

T.O.T. Mutual Aid.

IN December an exhibition of gifts of clothing received in response to an appeal to the Head Office Staff of the "Underground" Railways as presents for the children of the employees of the T.O.T. Companies who are serving with the Colours, was held in the Board Room at Electric Railway House, London, S.W. The exhibition was an exceptionally fine one, and an excellent example of what can be attained in this direction by combined effort.

The number of gifts received totalled 650, 130 of which represented the work of Mrs. Z. E. Knapp, wife of the Chairman of the T.O.T. Visiting Committee, who takes a great interest

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LONDON UNDERGROUND ELECTRIC RAILWAYS.

Exhibition of gifts of clothing for children of the employees of the T.O.T. Companies who are serving with the Colours.

in this part of the fund's activities. The balance represented the work of the women and girls of the clerical staff, who readily and generously responded to the call.

The officers, men and boys appreciating the difficulty they might experience in the art of "cutting out" and "making up," very kindly contributed a sum of money for the purpose of buying clothing suitable for the little boys.

Miss A. C. Smith, the originator and organiser of the "Clothing Fund," who in December, 1915, made a modest display of 50 garments, and in December, 1916, of 250, has every reason to be proud of the response to her appeal this year of over 650 as above mentioned.

At the close of the exhibition the gifts were taken over by Mr. Z. E. Knapp, Chairman of the Visiting Committee of the T.O.T., on behalf of the fund for distribution, and the thanks of the Committee are due to all those who so kindly contributed.

At this period in the history of the fund the following figures, which give in broad outline the result of its work after nearly 3½ years of war, will be of interest:—

The total amount spent by the fund in grants and regular allowances up to date is over £176,000.

The enlistments from the Companies' staffs number 14,400.

The total number of families to whom allowances and grants have been or are being made is over 9,100.

The total number of families now on the fund's pay roll is 5,250 (representing in individuals 13,400).

The weekly expenditure in grants and regular allowances is now £1,050.

A Quaint Railway Memorial.

FROM Barsham Rectory, Mr. G. M. Seaton writes:—

There is a quaint railway memorial which stands in the old disused parish churchyard of Bromsgrove, Worcestershire. Bromsgrove lies at the foot of the Lickey Hills, and the Midland Railway from Gloucester to Birmingham ascends the eminence by means of the famous inclined plane. The "Lickey" is the steepest incline to be found on an English through main line, being two miles in length. Unfortunately, at first the English engines not only could not draw a train, but actually could not take their own weight up the hill. The boiler of one of the failures blew up at Bromsgrove station on November 10th, 1840, killing two enginemen—Thomas Scaife and John Rutherford. The unfortunate men were interred side by side in Bromsgrove Churchyard, and on the headstone of each was carved an absolutely correct representation, not of the engine that killed them, but of the Norris locomotives—the successful American engines—one with a dome and the other without. Scaife's headstone was erected at the joint expense of his fellow-workmen, and bears the enclosed curious epitaph, introducing railway technicalities. This historic memorial has lapsed into a bad state, and the carvings and descriptions will soon be obliterated.

"My *engine* now is cold and still;
No *water* does my *boiler* fill.
My *coke* affords its flames no more;
My days of usefulness are o'er.
My *wheels* deny their wonted speed;
No more my guiding hand they need.
My *whistle*, too, has lost its tone,
Its shrill and thrilling sounds are gone.

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My *valves* are now thrown open wide—
My *flanges* all refuse to guide.
My *clacks*, also, though once so strong,
Refuse to aid the busy throng.
No more I feel each urging breath ;
My *steam* is now condensed in death.
Life's *railway* o'er, each *station's* past ;
In death I'm stopp'd, and rest at last.
Farewell, dear friends, and cease to weep ;
For Christ I'm safe ; in Him I sleep."

The Financial Future of British Railways.

A RAILWAY MAGAZINE reader who adopts the pen-name of "Hereford" writes :—

I read your summary of Mr. W. J. Stevens' contribution to *The Financial Times* with great interest. As a trader I agree that the Government has driven a hard bargain with the railways. But as railways are semi-public institutions, and have received charters or franchise from Government to construct railways and are protected from competition (except among themselves) as no competing methods lines can be constructed without Act of Parliament (*vide* Motor Roads to Windsor and Brighton were refused powers by Parliament, etc.) and as their capital is in some cases watered by splitting the stock, as in the case of the Midland and Taff Vale, they have not much to complain of, but lines like the Cambrian, Great Central, Midland and South Western Junction and others who only pay a small dividend have some reason to complain.

I venture to submit a few proposals which the Special Committee of the Board of Trade might well consider, as it would save money to the railways and to traders, and the country generally, after the war.

(1) POOLING OF RAILWAY WAGONS. This has proved a great success, although very few new wagons are being built and the traffic of the country was never larger than now, yet by the elimination of return empty haulage a great saving in wagons, train mileage, etc., has been effected. The scheme ought to include vans, cattle and timber and flat trucks also. Possibly the railways might form a Wagon Trust between themselves after the war, each company contributing its present wagons at a valuation, and the Railway Clearing House looking after the control of empties when returned from one company to another to balance accounts.

(2) RUNNING MIXED TRAINS. These have been discouraged by the Board of Trade on the grounds of safety, and their length is also awkward. I suggest that railways might be allowed to carry passengers in guards' van of goods train if passengers sign a form relieving railway company of responsibility in case of accident. This used to be done on the Highland Railway, until stopped by Board of Trade.

The passenger service on many country lines is now only three or four per day, and many would-be passengers bicycle or motor locally. I submit it is safer to travel 20 miles by goods train than by motor. The Board of Trade hedge railways around with a lot of regulations, whereas anyone can drive a motor on the roads, frequently to the danger of himself and the public.

(3) PETROL CARS DRIVEN BY ONE MAN ON THE RAILWAYS FOR USE ON BRANCH AND COUNTRY LINES, SIMILAR TO MOTORS ON ROADS. These would do for special trains also, and be safer than motoring by road. No guard need be carried, but an automatic brake to be used by passengers in case of need could no doubt be fitted.

At present local passenger traffic on country lines is being lost by Railway Companies through insufficient train service. And the ordinary train of driver, fireman and guard would be too expensive. Hence the need of something cheaper.

(4) PERMISSION FOR MORE SMALL LINES TO BE WORKED AS LIGHT RAILWAYS. The need for economy after the war ought to induce the Board of Trade to relax some of their rules. Motor cars have altered our views of transport on the roads and unless the railway companies are allowed some latitude, a great deal of local passenger traffic in country districts will be taken by road motors, to the detriment of the roads, at the expense of the ratepayers, and competition with the railways.

I may mention there is a road motor service from Birmingham to Worcester and Malvern duplicating the railway. This is under no statutory obligation like the railways, has no road to keep up, and is practically free from Board of Trade restrictions as compared with railway regulations.

If one person gets killed in a railway accident there is more fuss made by the Board of Trade than if a dozen are killed in a tramway accident, and no notice beyond a Coroner's inquest if anyone is killed by a motor car.

If a trespasser gets killed on the railway in this country, the railway company is blamed for not keeping trespassers off ; but in the United States the reverse is the rule. It is the trespasser's own fault if he gets killed. Motor cars have made public roads almost as dangerous as walking on the railway, yet no elaborate rules govern them as the Board of Trade restrict the railways.

Caledonian Railway 4-6-2 Tank Engines, 944 Class.

THROUGH the courtesy of Mr. W. Pickersgill, we are able to give the following particulars in response to applications from interested readers.

These engines have 19½ in. by 26 in. cylinders, which are outside, and 5 ft. 9 in. driving wheels. The boiler has a total heating surface of 1,716 sq. ft., the grate area being 21·5 sq. ft. Working pressure is 170 lbs. per sq. in., and Ross' patent safety valves are fitted. The superheater is the Robinson type, but without the usual smoke-box damper. The snifting valves are placed behind the chimney and are connected to the saturated steam side of the steam-collector, so that when the engine is running without steam, atmospheric air is drawn into the superheater elements, thus cooling them and rendering a damper

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unnecessary. The coupled wheelbase is 13 ft. 3 in. and the total wheelbase 33 ft. 1 in. The tank capacity is 1,800 gallons, fuel space being provided for 3 tons of coal. Mechanical lubrication is applied to the cylinders and piston valves, the lubricator being driven from a return crank fixed to the trailing crank pin; the lubricator itself being placed inside the cab. The adhesive weight is 54¼ tons, the total weight in working order being 91½ tons. The tractive force is 19,486 lbs. The engines—which are 12 in number—were built for the Coast Service to Gourock and Wemyss Bay, and in this work they have fulfilled all expectations.

Somerset and Dorset Railway History.

An item of interest is contributed by Rev. J. B. Baron Collins, who is well-known to many Railway Magazine readers as an authority on the history of the railways in Somerset, Devonshire and Cornwall. Writing from Malmesbury early in January he remarks:—"Yesterday I was reading a book on Somersetshire, one of a series brought out as the Cambridge County Geographies. On page 166 (speaking of the Somerset and Dorset Railway) it states: 'On its way from Burnham to Templecombe it crosses the district known as Turf Moor, where the ground is so soft and yielding that it is said that the embankment, which had to be built on piles, sank several feet after its completion.' Also, page 19: 'In 1607, when the (sea) wall near Burnham gave way, a tract of country 20 miles long and 5 miles wide, extending as far inland as Glastonbury, was flooded ten or twelve feet deep, with disastrous results to life and property, as we learn from a chap-book of the time.'"

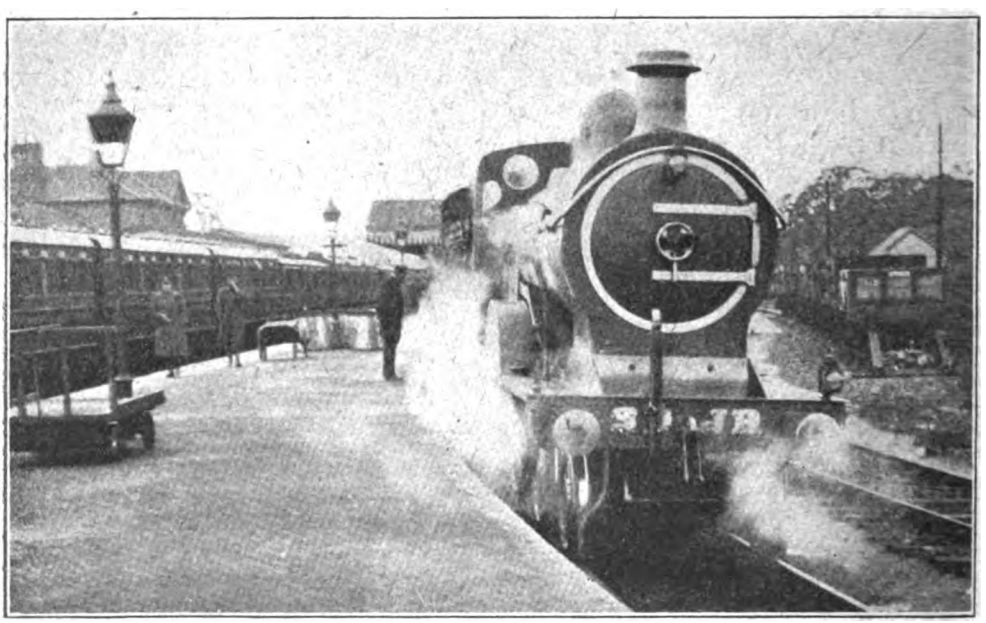
Presentation to Mr. Oliver Holt.

Following upon the retirement of Mr. Oliver Stanbrooke Holt, Secretary, Great Central Railway, that gentleman has been entertained at dinner and presented by his brother officers with a handsome antique screen bearing gold decoration, as a memento of their regard. The inscription on the back of the screen reads as follows:—"Presented to Oliver S. Holt, Esq., by his brother officers of the Great Central Railway as a token of friendship and esteem, on his retirement from the secretaryship."

The presentation was made by Sir Sam Fay, General Manager, Great Central Railway, who was supported by nearly the whole of the officers of the company.

Sir Sam Fay submitted apologies for the unavoidable absence of several of Mr. Holt's late colleagues, each of whom had written conveying their good wishes. In referring to Mr. Holt's long railway experience, Sir Sam said that these were days of "S.O.S."—save or starve—entirely different from the days when we possessed the inestimable blessings of peace and plenty. They would, however, have been guilty of great ingratitude to Mr. Holt had they departed from the time-honoured custom of inviting him to a dinner on his retirement from active service.

Continuing, Sir Sam Fay observed that he himself had now been with the company for a



Photo] [*A. S. Wilson-Jones.*

SOMERSET AND DORSET JOINT RAILWAY.

Bournemouth-Birmingham Express at Templecombe.

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period of 16 years, and he well remembered the day when he first went to Manchester to take up the duties of General Manager, he did so not entirely without a feeling of curiosity as to the kind of reception he was going to receive at the hands of the Great Central officers, all of whom were then unknown to him; but he had not been in London Road station very long before there loomed up on the horizon the genial presence of Mr. Holt. It was an old saying that first impressions were generally the soundest, and his impression of Mr. Holt was this: "Well, if he is a specimen of the other officers any misgivings on this score will be speedily removed." It had always been a very great pleasure to himself to be associated with Mr. Holt—they had never had a "wry" word—and he need hardly say they all extremely regretted that he was now relinquishing his tenure of office, after a service of nearly forty years, during which period he had had so exceptional a career, and had filled the position of Secretary for 25 years. Although the times were so very cloudy—the outlook not only for railways, but for the nation at large, being fraught with all kinds of change and possibilities—they nevertheless were all actuated by the one desire that Mr. Holt would enjoy good health in his retirement, that he would have a long and happy life, and in years to come would look as well and hearty as other retired officers of the company whom he had the pleasure of seeing round the table that evening.

Mr. Holt, in thanking Sir Sam Fay and all his brother officers for the innumerable acts of kindness that had helped and smoothed his career, said his grateful thanks were due to his assistant, Mr. W. H. Edge, and to all his staff. In honouring him they honoured them. There was not an officer present who would not admit how great was the debt they one and all owed for the loyal support received from valued and helpful assistants. He also begged to thank his eldest colleague, Mr. Rostern, for the trouble he had so kindly gone to in ministering to their pleasure that evening, and finally he had to tender to all his colleagues his sincerest thanks for the handsome screen which they had presented to him and his family.

Mr. Edward Watkin, General Manager of the Hull and Barnsley Railway, asked permission to say a few words in regard to his former connection with the Manchester, Sheffield and Lincolnshire Railway, and his old comradeship with Mr. Holt, whom he had known during practically all his railway career and probably longer than anybody present that evening. Mr. Watkin amusingly related some incidents of his early days when assistant to and afterwards the Mineral Manager of the company, and described Mr. Holt as being a veritable pantechnicon of railway secretaryship, for not only had he been for so many years the Secretary to the Great Central Railway but also the Secretary to other subsidiary lines too numerous to mention.

In addition to the presentation above referred to, Mr. Holt has further been given a handsomely bound album containing a beautifully illuminated address from the whole of the secretarial staff at Marylebone and Manchester, subscribed by those on duty at home and those on active service overseas.

Some Curious Railway Station Names.

To further supplement Mr. Hopwood's article in the December, 1917, RAILWAY MAGAZINE, the following examples of Scottish station names have been forwarded by Mr. C. C. Littlejohn:—

To commence with stations which rhyme, Uddingston and Duddingston are both on the North British Railway, while other instances of this are Hoy (Highland Railway) and Moy (Highland Railway); Ayton (North British) and Brayton (Caledonian); Penton (North British) and Renton (Dumbarton and Balloch Joint); Aberlour (Great North of Scotland Railway) and Aberdour (North British); and Falkirk (North British) and Halkirk (Highland Railway); also a "triplet," Beith (Glasgow and South Western), Keith (Highland Railway) and Leith (Caledonian). Stations which closely resemble each other in name, though on different railways, are Largs (Glasgow and South Western) and Largo (North British); Lyne (Caledonian) and Lyneside (North British); Insch (Great North of Scotland Railway) and Inches (Caledonian); Culter (Great North of Scotland Railway) and Coulter (Caledonian); Carmyle (Caledonian) and Carmyllie (Dundee and Arbroath Joint); Calcots (Great North of Scotland Railway) and Cauldcots (North British); Stobs (North British) and Stobo (Caledonian); Kinloss (Highland Railway) and Kinross (North British), etc. Breich and Brechin are both on the Caledonian Railway, though far apart; the same remark applies to Oyne and Aboyne, both on the Great North of Scotland Railway, and Dava and Daviott, on the Highland. Both the Caledonian and North British have stations named Barnhill, but the former is in Forfarshire and the latter in Glasgow; the Caledonian also have a signal-box at Perth bearing the same name. Both the Caledonian and Great North of Scotland Railway have stations called Bankhead and Woodside, though, of course, they are far apart. Blackford (Caledonian) is likewise a long way from Blackford Hill (North British), and although the North British have both Morningside and Morningside Road on their system, the two stations are quite distinct, the former being in Lanarkshire and the other on the Edinburgh Suburban Line—a point which gives rise to some confusion at times, since the Edinburgh suburb is better known than the Lanarkshire town, despite the fact that the latter is the terminus of the branch line which serves it and also has a station on the Caledonian Railway. Other North British stations bearing somewhat similar names are Causewayend and Causewayhead, Crossgates and Crossgatehall, Gogar and Gorgie, and Saughton and Saughtree. Humbie is a station on the Gifford branch, in Haddingtonshire, but is also the name given to a signal-box on the spur line from Dalmeny to the Edinburgh-Glasgow main line.

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MR. W. F. JACKSON, the general manager of the North British Railway, who retires from the service probably in March, was born in Glasgow in 1855. For over five years he occupied different positions in a mercantile office in that city before entering on his railway career, which has proved so successful. It was in February, 1887, that he threw in his lot with the North British Railway; and for over 20 years he controlled the destinies of the rates and taxes department. In this connection, it is interesting to note that he has walked over the whole of the system under his control—over a thousand miles in length; and as one of his predecessors in the managerial chair was a Mr. John Walker, it was frequently remarked, jocularly, of course, that he was more of a walker than he. In July, 1899, he was appointed to the responsible post of general manager in succession to Mr. Conacher, retired; and for nearly 19 years he has conducted the affairs of the Company with the full confidence and respect of the Directors and the staff. It is also worth noting that in his early railway life he held the secretaryship of the Ayrshire and Wigtownshire Railway.

* * *

MR. JAMES CALDER, who succeeds Mr. Jackson as general manager, has the unique distinction of having been born on the Company's property. It was in 1869 at Blackhall that he first saw the light of day; and in keeping with the traditions of his family, he joined the service of the North British Railway. In 1883, at the age of fourteen, he made his railway debut, and for a number of years was engaged as a station clerk at different stations. For some five years he was employed in the office of the district superintendent at Glasgow, from which office he was promoted to the general manager's office. In 1903 he was appointed chief assistant to the general manager; and ten years later his services were recognised in his being made assistant general manager. And now, after having occupied that post for about four years, he is about to become the controller of the destinies of the line by filling the managerial chair.

[Lafayette.

MR. W. F. JACKSON.
Retiring General Manager, North British Railway.

* * *

MR. JOHN WALKER, who will become in course assistant general manager of the North British Railway in succession to Mr. Calder, served at different stations on the line before being appointed to the rates and fares department of the office of the superintendent of the line. His next promotion was as chief of the excursion department in that office; and after a number of years in that capacity he was chosen as chief assistant to the district traffic superintendent at Coatbridge, succeeding to the full charge of that office on the retiral, under the age limit, of Mr. Kidd. On the introduction of the train control office at Coatbridge, and the abolishing of the office of the district traffic superintendent at Coatbridge, Mr. Walker was removed to Edinburgh to fill the post of district traffic superintendent there, from which post he goes to become assistant general manager.

* * *

MR. WILLIAM ANDREW, who is about to vacate the post of chief goods manager of the North British Railway, under the age limit, is a native of the North of Scotland, and began his railway career in 1874. After having filled successfully several of the minor posts, he was, in 1893, appointed chief clerk to the general manager, when Mr. Cathles, secretary, was chosen to fill that position of trust. When Mr. Deuchars, the then assistant general manager, later superintendent of the line, and now retired, was appointed to be superintendent of the line in 1894, Mr. Andrew succeeded him as chief assistant to the general manager, the post of assistant general manager being done away with. Further promotion came in Mr. Andrew's way in 1903, when he was made assistant chief goods manager; and on June 1st, 1905, on the retiral of Mr. Rutherford, he was appointed

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chief goods manager. It may also be mentioned that in 1908 he was one of the six railway officers appointed by the Board of Trade to form with certain traders a sub-Committee of the Board of Trade Railway Conference then being held.

* * *

MR. JOHN WILKINSON, who succeeds Mr. Andrew, began as a boy in the office over which he is now to preside, and has served under three goods managers. He has had a great deal to do with litigation cases in connection with mineral rates; and, in fact, the most of the Parliamentary business connected with the chief goods manager's office. He has also had charge of the outdoor working department of the office; and now vacates the post of assistant chief goods manager to fill the chair of chief goods manager.

Photo] [*Lafayette.*

MR. JOHN C. CHRISTIE.

Appointed Assistant Chief Goods Manager, North British Railway.

MR. JOHN C. CHRISTIE, who succeeds Mr. Wilkinson, has had a wide experience in railway affairs, having been a station clerk, relief stationmaster, etc. For a year or two he severed his connection with the North British Railway to fill a post on the railways in India; but later returned, and was appointed to the goods train working department of the office of the superintendent of the line. On Mr. Walker's promotion to Coatbridge, Mr. Christie became chief of the excursion department, and in that capacity had a large share in the military arrangements in connection with the Royal Review in Edinburgh. On Mr. Cunningham's retiral from district superintendentship in Glasgow, Mr. Christie was chosen to succeed him; and from this post he goes to fill the position of assistant chief goods manager.

MR. MATTHEW S. STRANG, who takes up the duties of district superintendent in Glasgow, in succession to Mr. Christie, began his railway career on the North British line, and after having passed through different grades, was appointed to a stationmastership. He held, for instance, agencies at Jedburgh, Inverkeithing, and Perth, and was promoted from Perth to succeed Mr. Walker as chief assistant to the district traffic superintendent at Coatbridge, on Mr. Walker being appointed to the full charge of that office. On the introduction of the train control system at Coatbridge, Mr. Strang became the first control master; and when Mr. Strachan, the district traffic superintendent at Burntisland, was appointed as Coal Mines Controller for Scotland, Mr. Strang was chosen to succeed Mr. Strachan.

* * *

MR. DAVID MCROBBIE, who has been appointed to the important post of superintendent of the Fife district, in succession to Mr. Strang, began his railway career as a station clerk. For seven years he held clerkships at different stations, and gained experience in both the goods and passenger sections. He was afterwards promoted to the office of the superintendent of the line, first to the department dealing with special accommodation on trains, sleeping berths, special stops, etc., and later to the goods train working department. For many years he held the difficult position, especially in those days, of night clerk in this office, and in this capacity gained a very wide experience in railway matters, as all kinds of questions had then to be dealt with by the night clerk. He had also had a big share in the work involved under the Board of Trade Conciliation Scheme, and the introduction of the train control system; while he was also instrumental in bringing new ideas into operation, such as compiling a "Maximum Loads for Engines" booklet. On the retiral of Mr. Black, and the appointment of Mr. C. H. Stemp as operating superintendent, Mr. McRobbie was appointed as first chief assistant to Mr. Stemp, and the able manner in which he has discharged the duties pertaining to that office fully justifies the Directors in choosing him to fill such an important post as district traffic superintendent at Burntisland.

* * *

RECENTLY railway obituary included Mr. Joseph Simpkin who was for 50 years in the service of the North Eastern Railway. He retired about seven years ago, after completing the large electric pneumatic signalling installation in connection with the alterations at the Central station, Newcastle, and the opening of the King Edward Bridge over the River Tyne. He succeeded his father as works superintendent about 40 years ago, and served under the following well-known engineers: Mr. T. Harrison, chief engineer; Mr. A. Harrison, engineer (northern), and Mr. C. A. Harrison, chief engineer. During his career he carried out numerous large improvements and alterations, amongst which were the re-decking of the rail

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Photo [*Collins.*

MR. J. A. CAMPBELL.

Appointed Secretary, Great Central Railway.

Mr. Campbell's Biography appeared on page 67, January, 1918, RAILWAY MAGAZINE.

and roadway of the High Level Bridge, Newcastle; the reconstruction of the Central station, Newcastle; the re-fitting of the Loftus to Whitby branch, after the taking over by the North Eastern Railway from a private company. He also had the honour of signalling and interlocking the first signal-box working passenger trains in England by the electro-pneumatic system, namely, Pontop Crossing (Pelaw to Sunderland branch).

* * *

MR. T. F. YOUNG, writing from Darlington, remarks:—"In the January RAILWAY MAGAZINE I notice Mr. T. C. Adkins, of Cambridge, states a locomotive named *Easingwold* is working in that district. Perhaps it will interest him and other readers to know that this engine originally worked on the Easingwold Railway, when it was sold to a public works contractor in the north. The engine was purchased from this contractor last year, was brought to this town, where it received a thorough overhaul, was fitted with new steel tubes and firebox as well. After the necessary repairs, etc., were completed, it was sent to work at Cambridge. The firm who repaired this locomotive make a speciality of repairing this type of engine, and have turned out a considerable number for war work, both standard and narrow gauge engines. This firm recently purchased two locomotives from the Dublin and South Eastern Railway, which engines were originally built at Crewe by the late Mr. Webb. They are 2-4-2 side tank engines with 4 ft. 6 in. driving wheels. They are now being converted from the Irish to the English gauge, and at the same time will be stripped, overhauled and repaired, fitted with new steel fireboxes and tubes. The engines have inside cylinders 17 in. diameter by 20 in. stroke and are fitted with the automatic vacuum brake ejector, valve and coupling pipes.

* * *

FROM Catford Mr. D. H. Stuart writes:—"Following the paragraph by Mr. K. Paton in the January RAILWAY MAGAZINE, *re* shed changes of South Eastern and Chatham Railway locomotives 760-781, No. 769 is now at shed 10 (Strood and New Brompton). This locomotive and 770 have large yellow letters on the tender, but are still painted green. 450 is also painted thus. With regard to the query as to what class Nos. 760-781 belong, I should like to say they are now Class 'L.'" Several other readers have likewise written in response to Mr. Paton's question, and thanks are due to all.

* * *

NUMEROUS RAILWAY MAGAZINE readers have written to our Crewe correspondent, Mr. C. Williams, for further information concerning the stations of the London and North Western Railway "Claughton" locomotives—in furtherance of those that have appeared in this periodical. Mr. Williams has therefore forwarded the following details:—"With the exception of Nos. 986 and 1103, all the new batch of four-cylinder 'Claughton' locomotives, referred to on page 429 of the October RAILWAY MAGAZINE, are now in service. Of these, two, Nos. 1085 and 2426, are stationed at Camden, and the rest at Crewe. In connection with the rearrangement of the stations of the 'Claughton's' Nos. 2420 and 2427 are now at Camden, having been transferred from Carlisle. Thus, Crewe now have 34 of the class; Camden, 9; Rugby, 7; Carlisle, 3; Edge Hill, 3; Preston, 2; making, with the two not yet in service, a total of 60 engines. A new batch of 0-8-0 superheater goods engines is in hand at Crewe, bearing Nos. 94, 112, 360, 851, 2088, 2256, 2274, 2290, 2296 and 2423. They replace six-wheeled coal engines of Mr. Webb's design, now transferred to the duplicate list. The latest four-cylinder compound passenger engine to be converted to two-cylinder simple ('Renown' class) is No. 1960 *Francis Stevenson*. This brings the total number of 'Renown' class engines to 22, of which 11 were formerly 'Alfred the Great' class and 11 'Jubilee' class."

* * *

SEVERAL Hull and Barnsley 0-6-0 type engines are at present working on the South Eastern and Chatham Railway and a RAILWAY MAGAZINE reader on passing Ashford recently saw as many as six of these engines in the yards there. The engines were of the latest type with large domeless boilers.

* * *

MR. J. MACARTNEY ROBBINS, whose name is well-known to students of railway photography, writes concerning the whereabouts of London and North Western Railway locomotive, No. 1120, *Thunderer*, in which so many RAILWAY MAGAZINE readers appear to be interested. After

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remarking that the engine is now stationed at Camden and is being used to work passenger trains of secondary importance or express goods trains, Mr. Robbins continues :—"On Tuesday, December 4th, 1917, I travelled behind *Thunderer* on the 2.45 p.m. newspaper train from Euston. The regular engine had failed, so No. 1120 was requisitioned. She managed to lose about 5 min. between Euston and Northampton with a load of 302 tons. This shows that *Thunderer* has seen better days and is not in prime condition. More recently still I have seen this engine working relief trains from Euston."

Then Mr. Robbins adds :—"Can any RAILWAY MAGAZINE reader tell me if there are any 'Prince of Wales' or 'George V.' engines stationed at Leeds? If so, what are they?"

* * *

IN response to Mr. Bourne's query in the January RAILWAY MAGAZINE, several readers have forwarded particulars of the Midland Railway locomotive shed code as follows :—

1 Derby	18 Nottingham
2 Burton	19 Liverpool
3 Birmingham	20 Buxton
4 Worcester	21 Manchester
5 Brecon	22 Westhouses
6 Upper Bank	23 Hasland
7 Gloucester	24 Staveley
8 Bristol	25 Sheffield
9 Peterborough	26 Normanton
10 Leicester	27 York
11 Wigston	28 Leeds
12 Kettering	29 Bradford
13 Wellingborough	30 Skipton
14 Bedford	31 Carnforth
15 Child's Hill	32 Lancaster
16 Kentish Town	33 Carlisle
17 Toton	

* * *

A CORRESPONDENT states that it is now possible at times to see as many as four different railway companies' locomotives at one time in the neighbourhood of Cricklewood on the Midland main line. These comprise several different types and on one occasion recently they consisted of the following :—Midland Railway, 0–6–0 (tender and tanks) and 4–4–0; Midland Railway (London, Tilbury and Southend) 4–6–4 and 0–6–2 tank engines; London and South Western Railway 4–4–0, 0–6–0 and 0–4–2; Great Northern Railway 0–6–0 with tender; Somerset and Dorset Joint Railway 2–8–0. One of the last of these engines, namely, No. 85 (Somerset and Dorset Joint Railway) has for some time past been working coal trains between Wellingborough and Cricklewood and its performances are being carefully noted with a view, we may presume, to the introduction of the 2–8–0 type as one of the Midland standards of the future. The collection of locomotives is thus an interesting one, but it is perhaps seldom that the types are all conjointly present.

* * *

ROSYTH (Halt) on the North British Railway was opened for passenger traffic on January 1st. It is situated between Inverkeithing and Dunfermline (Lower) on the Edinburgh–Perth main line, and a service of about a dozen trains in each direction is provided on week-days, also one or two on Sundays.

* * *

REFERRING to Mr. Hopwood's article in the RAILWAY MAGAZINE, December, 1917, entitled "Some Curiosities of Railway Station Names," Mr. Herbert Marshall, Maidenhead, points out that New Quay Road was recently re-named Bryn Teify.

* * *

To consider the question of the declaration of the dividend on the consolidated ordinary stock for the year 1917, the board of directors of the Furness Railway will meet on February 8th, and the decision will be announced to the press and the Stock Exchanges on the same day.

* * *

IN continuance of its good work the London "Safety First" Council, of which Mr. H. E. Blain, Underground Railways, is an hon. secretary, in addition to the issue of an excellent calendar has published a poster setting forth "Safety First" object lessons for school children. Some of the hints would be useful if acted upon by "children of larger growth." They are as follows :—

IT IS DANGEROUS

1. To step off the kerb with your back to an approaching vehicle, because you may be knocked down by it.
2. To sit on the kerb, which is provided to keep vehicles off the path.
3. To indulge in "free rides" on carts, omnibuses, tramcars, etc. You must eventually get off, and may be run over by another vehicle, or you may fall and injure yourself.
4. To dash out of the school entrance, because you may collide with a school-fellow or pedestrian, or run into a passing vehicle.
5. To play in the roadway, particularly in a busy thoroughfare, as, in your excitement, you may not notice the approach of a fast-moving vehicle which could not be pulled up in time to prevent an accident.
6. To pass in front of a stationary vehicle, if other vehicles are coming along behind it.

IT IS SAFE

1. To walk on the footpath, and particularly on the left-hand side of it, where you will always be facing the on-coming traffic.
2. To cross the roadway after having looked both ways and made sure that no traffic is approaching from either direction, and, when dark, to start from a street lamp.
3. To cross the roadway of a wide thoroughfare at a point where there is a refuge, which is half-way to safety.
4. To pass out from behind a vehicle if you know the road is clear.
5. To cross where two streets meet if both are free from traffic.
6. To enter, or alight from, an omnibus or a tramcar when it is at a standstill.

* * *

RAILWAY engineers, perhaps, do not need a reminder that on January 2nd The Institution

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of Civil Engineers completed the hundredth year of its existence, having been established in 1818 at a meeting of eight engineers at the Kendal Coffee House in Fleet Street.

* * *

FOR the last two years the Canadian Pacific Railway, in connection with the Pacific steamers of the Canadian Pacific Ocean Services, has carried a very large proportion of the passengers from the United States to Russia, and as these passengers have included a great many American railroad men, who have been surprised at the excellence of the service, a remarkable volume of trade is developing, greatly to the benefit of Canada itself. Among these passengers was the American Railway Advisory Commission, consisting of the leading railway experts of the United States, who travelled from Chicago to Vancouver and thence to Yokohama *vid* the *Empress of Asia*. Mr. Henry Miller, vice-chairman of this highly important commission, has written Vice-President G. M. Bosworth a letter of deep appreciation, in which, after referring to many individual courtesies along the route, he remarks: "You have good reason to be proud of your organisation and service, and we take this method of thanking your heartily for your kindness and courtesy."

* * *

A MODEL of a new idea for the permanent way for railways was recently demonstrated to a small gathering at Townsville, Queensland. The system entirely discards wooden sleepers, dog spikes, etc., and reduces the cost of maintenance to a minimum. Two parallel concrete walls carry the rails, which are clipped to their position by specially construeted clips, attached to steel tie plates, which are about 10 ft. apart. The springs under the rail fitted in the wall prevents the rail from wearing on the concrete. Water conservation tanks can be fixed between the rails for engine supply purposes, doing away with the present iron tanks on frames. The inventors claim the simplicity of the device, its solidity and apparent safety commend it for serious consideration by the Australian State Governments. It is claimed that the permanency of the structure, and as there will be practically no maintenance costs, that the saving will quickly pay for the extra cost of construction. If any tramways can be laid down on the new principle which should be of especial value to municipalities and sugar estates, where tramways are in vogue, it is the intention of the inventors to offer it to the various Governments, and to patent the important parts of the discovery.

* * *

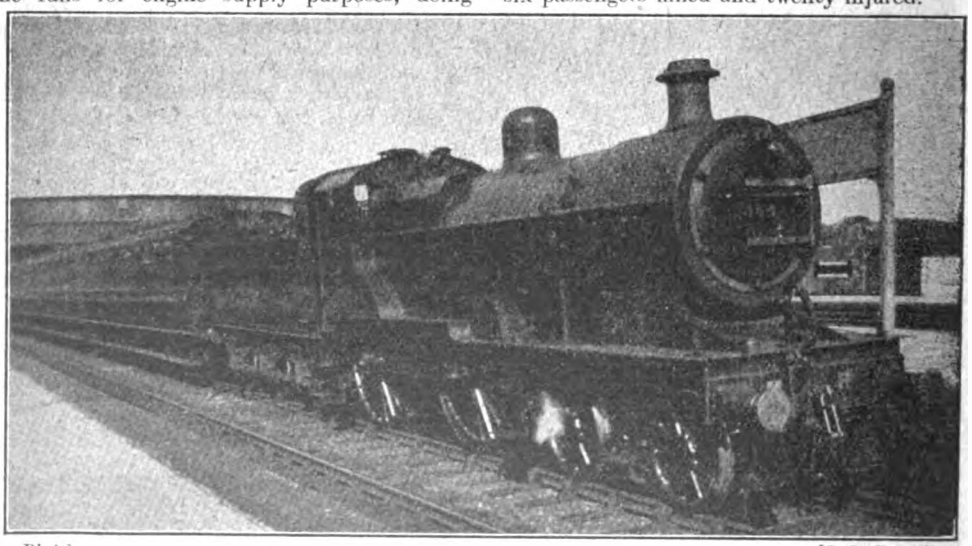
A LONDON reader, Mr. E. D. Ward, writes:—"With reference to the articles appearing in your columns upon 'Tablet exchanging at speed,' no mention has been made of a system in use for many years past upon the New South Wales Government Railways southern line between Picton and Albany, a distance of about 300 miles. It is illustrated and described in *Engineering*, April 6th, 1894, p. 449, and also in the *International Railway Express Bulletin* of that year. Some modifications of the exchanging apparatus on the engine, as also the ground exchanger, have been made from time to time as experience suggested, but the main principle existed up to at any rate five years ago."

* * *

EARLY in January the Great Eastern Railway announced that on and from February 1st, 1918, they would discontinue to supply sea water.

* * *

ON Saturday, January 19th, the 8.40 a.m. train from St. Pencras to Glasgow ran into a landslide at a spot called Long Meg, between Little Salkeld and Lazonby, about fifteen miles south of Carlisle. The whole train was derailed, six passengers killed and twenty injured.



Photo] [*L. R. Tomsett.*

MIDLAND RAILWAY.

Passenger train at Elstree. 4-4-0 rebuilt, superheater locomotive, No. 554.

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…otive Engineer.
…akefield Lubricator.)

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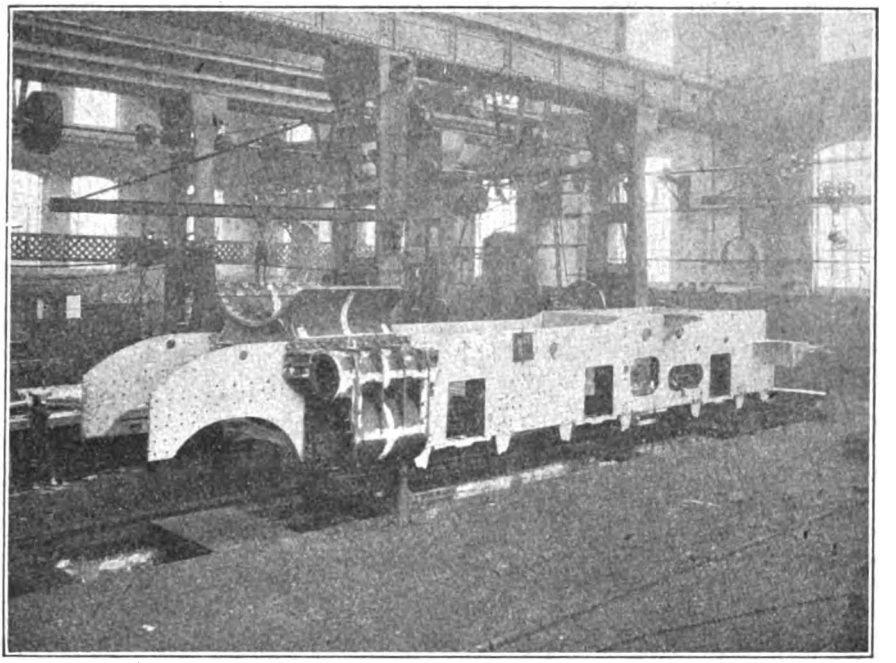

FRAMES WITH CYLINDERS AND SMOKE-BOX SADDLE CASTING BOLTED UP.

The 2-6-0 Type Locomotives of the Great Northern Railway.

By CHAS. S. LAKE, M.Inst.L.E.

THE Great Northern was among the railways in this country which, some years back, had experience of the 2–6–0 type locomotive, having in 1900 taken delivery of some engines of this type built in the United States. Many years prior to the appearance of these American locomotives on the Great Northern, Midland and Great Central Railways, however, there had already been "Moguls" at work on the Great Eastern, so that the type cannot be considered a new one in British railway practice. At the same time it is now-a-days looked upon as an entirely modern class and one which is to be regarded in a doubtful sense by many of those who study and practice locomotive working in these islands.

The 2–6–0 wheel arrangement provides a natural development of that very widely used one—the 0–6–0. It introduces a free axle at the leading end, and assists in the distribution of weight when a larger boiler is desired, and may be said at the same time to facilitate the use of cylinders of greater capacity than is convenient with the other type, although this does not necessarily constitute a motive for extending the wheelbase. It is preferred by some locomotive engineers when planning a "mixed" traffic locomotive, being more adaptable to high speed work than the 0–6–0 and less expensive to build than the 4–6–0. Although some criticise the use of a two-wheeled truck at the leading end of a fast-moving engine, there is nothing in practice to support that view, provided, of course, that the design of the truck is such as to render it steady and flexible at the high speeds required, taking into account the curvature of the road traversed and any other conditions that affect the point. Many engineers, and, indeed—if the current practice on British railways be studied—it might almost be said the majority, are indicating a desire to utilise more powerful goods train locomotives incorporating six-coupled wheels. In the circumstances it is often deemed advisable to extend the wheelbase,

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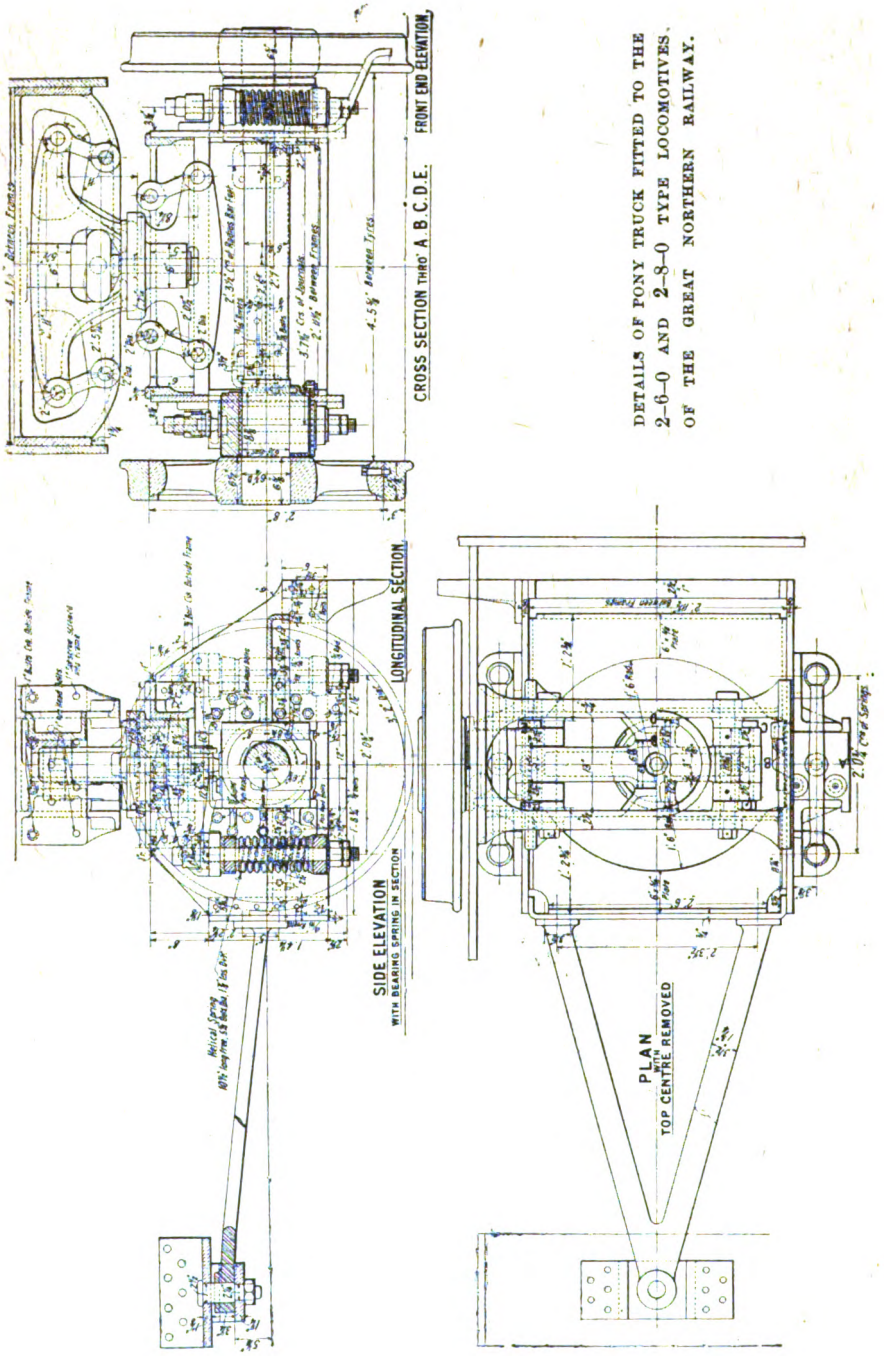

DETAILS OF PONY TRUCK FITTED TO THE 2–6–0 AND 2–8–0 TYPE LOCOMOTIVES OF THE GREAT NORTHERN RAILWAY.

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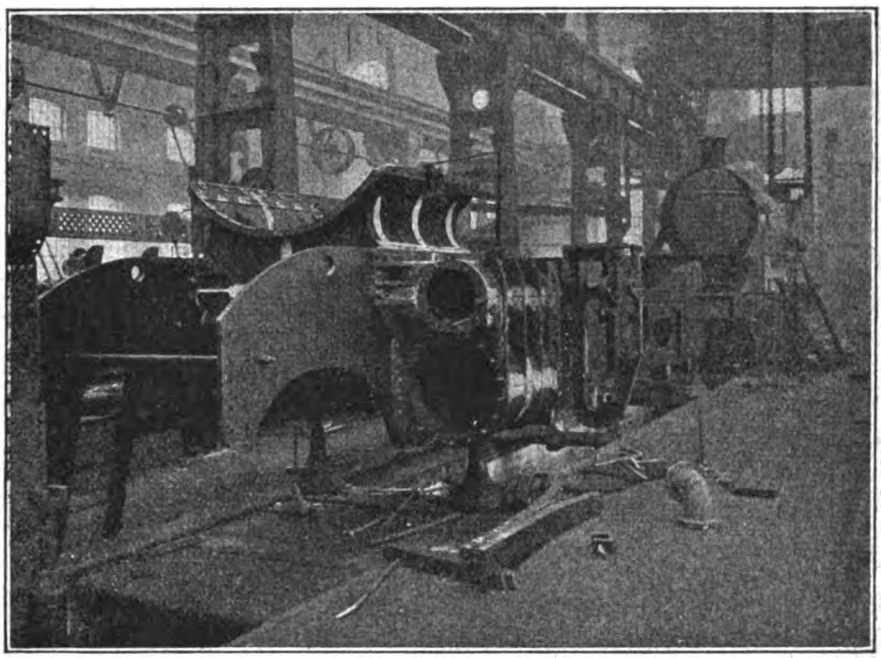
and in doing so some jump direct from the 0-6-0 to the 4-6-0, neglecting, for reasons best known to themselves, the handy intermediate 2-6-0 type.

It would be difficult to particularise the exact advantages which the 2-6-0 locomotive offers on different lines of railway. It is a question of speeds, loads, grades, permanent way, curves, and so forth, and only those responsible for the conduct of the traffic on individual lines and for the provision of the locomotive power to work it, can in the light of the knowledge they possess say whether the 2-6-0 type of engine is required or not. The type should certainly be a lighter and cheaper one than the 4-6-0, whilst its power capacity can be, although not necessarily, greater than that of the 0-6-0 type. The wheel arrangement now being considered is decidedly superior to the 0-6-0 when it is desired to fit large outside cylinders. The additional support at the front end relieves the frames considerably, and although, as a matter of course, a proportion of the weight of the engine is nullified for adhesive purposes, the percentage is a relatively small one, and owing to the larger and heavier boiler usually fitted, the 2-6-0 is ordinarily found to have an equal or greater amount of weight available for adhesion than the other type. As, however, larger cylinders are, as a rule, employed, there is not much to be said either one way or the other in respect to this point.

The number of 2-6-0 type engines to be employed on the Great Northern Railway is a large and increasing one. The earlier engines of this class had rather smaller boilers than the subsequent ones, and although they were, and are, remarkably efficient, the later engines are distinctly superior from the steaming point of view, and are every day performing the most excellent work in dealing with different classes of trains. These latter include trains running on fast passenger schedules as well as heavy slow moving goods trains and intermediate passenger trains making frequent stops and restarts. The engines have proved themselves easily capable of maintaining high speeds for long distances and of reaching velocities which, considering the relative smallness of the coupled wheels, are to be considered remarkable. In view of this constantly recurring high-speed work, special attention was paid by Mr. Gresley to the design of the pony-truck, a drawing



ANOTHER VIEW OF MAIN FRAMES AND CYLINDERS.
Motion plates have been added and other work done.

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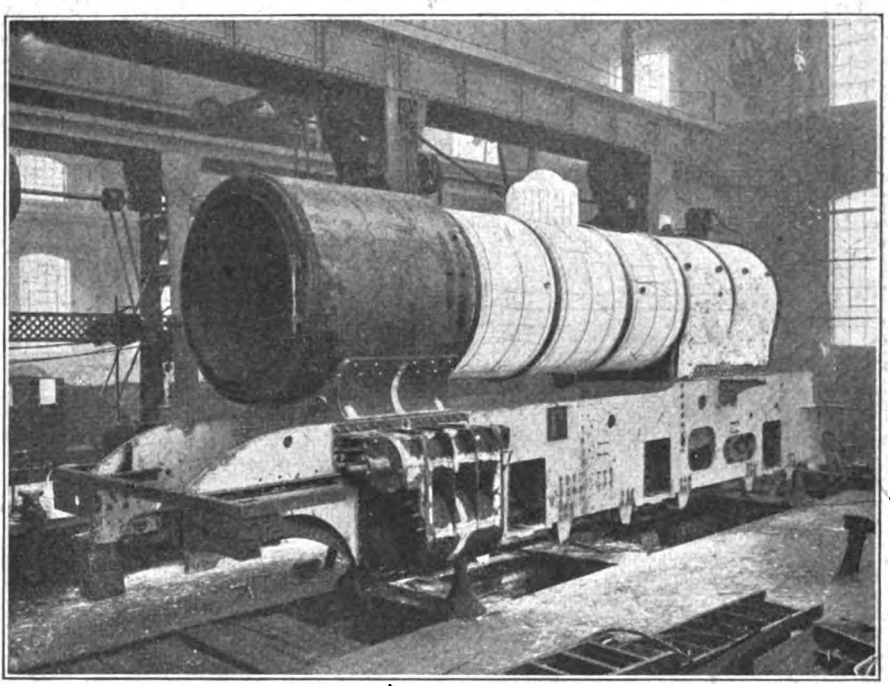
showing the details of which appears on page 144. The truck is pivotted by a radius bar to a cross-frame stay-plate behind the cylinders and carries a swing bolster connected to its frame by means of inclined links. A similar inverted swing bolster is carried by other inclined links from the main frame of the engine and engages by means of a cup-shaped centre with the pony-truck bolster. There are no side bearings between the engine, and the pony-truck and the links are so arranged that one pair inclines in an opposite direction to the other, and the tendency of either of the wheels to lift on a curve is thereby obviated. Any rolling or surging of a locomotive fitted with a pony-truck having ordinary swing links causes more weight to be thrown on one or other of the truck wheels and correspondingly reduces the weight on the opposite wheel. This well-known fact accounts for the prejudice exhibited by some against the use of pony-trucks on high-speed locomotives.

The object of the arrangement designed by Mr. Gresley, of double bolsters is to equalise the weights carried by each of the pony-truck wheels at all times whether the engine is on a straight road or on a curve, whilst at the same time the centralising control obtained with the ordinary swing link pony-truck is retained. The truck has proved equally satisfactory under all conditions of running and entirely so when hauling heavy express passenger trains frequently run at speeds up to 70 miles per hour.

The engine runs on a total wheelbase of 24 ft. 10 in., the greatest spacing being between the driving and trailing wheels, namely, 9 ft., which allows of a fairly long firebox. The coupled wheels sustain 51 tons 14 cwt. of the weight of the engine, whilst an additional 10 tons is carried by the wheels of the leading truck, so that of the 61 tons 14 cwt. which represents the weight of the engine in working order, rather more than five-sixths is available for adhesion. In the 0-6-0 type engines of the same railway, which have 19 in. by 26 in. cylinders as compared with the 20 in. by 26 in. ones of the 2-6-0 type, the weight is 50½ tons, and as additional wheels are absent this, of course, represents the weight available for adhesion.

The cylinders in the 2-6-0 type are cast with their steam chests for piston valves above them and bolted to the frame on each side as a complete unit. As the constructional view on pages 143 and 145 show the



BOILER MOUNTED ON FRAMES AND "CLOTHED" WITH ASBESTOS INSULATING MATERIAL.

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cylinder castings are substantially ribbed, whilst the space between the main frames is strongly braced by the smokebox saddle casting at the point where the cylinders connect. The piston valves have a diameter of 10 in. They are of the inside admission type and work with a lap of 1¼ in. The lead is ⅛ in., but as the valves have trick ports, the lead is equal to ¼ in. A notable point is the exhaust clearance, which is 5/16th in., a full exhaust opening being obtained when the engine is notched up to cut off as early as 15 per cent., and consequently a very free exhaust is obtained.

One of the advantages secured by adopting inside admission is that exhaust clearance can be used. With outside admission the use of this results in a certain amount of baffling, due to the fact that the exhaust steam at the moment of release is able to blow across through the opposite port and not only have the effect of nullifying the exhaust opening on that side but actually setting up back pressure.

The table reproduced below shows the valve movements at a glance :—

ing the piston valves, and as stated in another article in this issue of the RAILWAY MAGAZINE, Mr. Gresley has applied a ball-bearing to the return crank on one of these locomotives, with the result that wear has very considerably diminished at that point.

The boiler is set upon the frames with its centre 8 ft. 7 in. above the rail level. The barrel is 11 ft. 8 in. long, built in two telescopic rings, and has a diameter of 4 ft. 8 in. outside next the firebox. The firebox is of the round top pattern and has a length of 8 ft. over the casing. The boiler is shown in one of the appended illustrations, mounted on the frames in the erecting shop at Doncaster Works, the asbestos "clothing" having been applied. The boiler is fitted with superheating apparatus and carries a working pressure of 170 lbs. The heating surfaces are arranged as follows :—

125 tubes 1⅜ in. ex. diam.	687	sq. ft.
18 „ 5¼ in. „ „	294	„
Superheater	302·8	„
Firebox	137	„
Heating surface, total	1420·8	„
Grate area	24·5	„

TABLE OF VALVE SETTING.

2-6-0 CLASS ENGINE.

Piston valve, 10 in. diameter, inside admission; lap of valve, 1¼ in.; size of cylinders, 20 in. diameter by 26 in. stroke.

FORWARD GEAR.

Mean cut off.	Travel of valve.	Lead. F.	Lead. B.	Valve opening. F.	Valve opening. B.	Cut off. F. Inches.	Cut off. F. Per cent.	Cut off. B. Inches.	Cut off. B. Per cent.
25%	3″	⅛″	3/32″	¼″	¼″	6½	25·0	6⅝	25·4
30%	3¼″	⅛″	3/32″	5/16″	5/16″	7¾	29·8	7⅞	30·2
40%	3 11/32″	⅛″	3/32″	7/16″-1/32″	7/16″B	10 7/16	40·1	10¼F	39·4
50%	3⅜″-1/64″	⅛″	3/32″	¼″+1/32″	9/16″+1/64″	12⅞	49·5	12⅜	47·59
60%	4″-1/64″	⅛″	3/32″	11/16″+1/64″	¾″+1/32″	15½	59·6	14 11/16	56·48
70%	4 9/16″	⅛″	3/32″	1″B	1 1/16″F	18 3/16	69·9	17	65·3
Full over	5 9/32″	⅛″	3/32″	1 11/32″	1 7/16″B	20 5/16	78·0	19	73·0

BACKWARD GEAR.

25%	3 1/16″	⅛″	3/32″	9/32″B	9/32″B	6½	25·0	7⅜	28·3
30%	3⅛″+1/64″	⅛″	3/32″	5/16″	5/16″+1/64″	7¾	29·8	8½	33·6
40%	3⅜″	⅛″	3/32″	13/32″	15/32″	10½	39·4	11½	43·2
50%	3⅜″+1/32″	⅛″	3/32″	17/32″F	⅝″F	13	50·0	13½	52.9
60%	4 1/16″	⅛″	3/32″	23/32″B	27/32″	15½	59·6	15¾	61·0
70%	4⅝″	⅛″	3/32″	31/32″	1 5/32″	18 3/16	69·9	18 1/16	69·4
Full over	5¼″	⅛″	3/32″	1¼″F	1½″	20	76·9	19⅜	75·4

TABLE SHOWING THE SETTING OF THE PISTON VALVES, GREAT NORTHERN RAILWAY 2-6-0 TYPE LOCOMOTIVES.

The cylinders are bolted up to the frames in a horizontal position and the connecting rods drive the intermediate coupled wheels. Walschaerts' valve gearing is used for actuat-

This boiler exhibits excellent steaming qualities and the cylinders in all circumstances are kept well supplied. The cylinders and valves are lubricated by means of a

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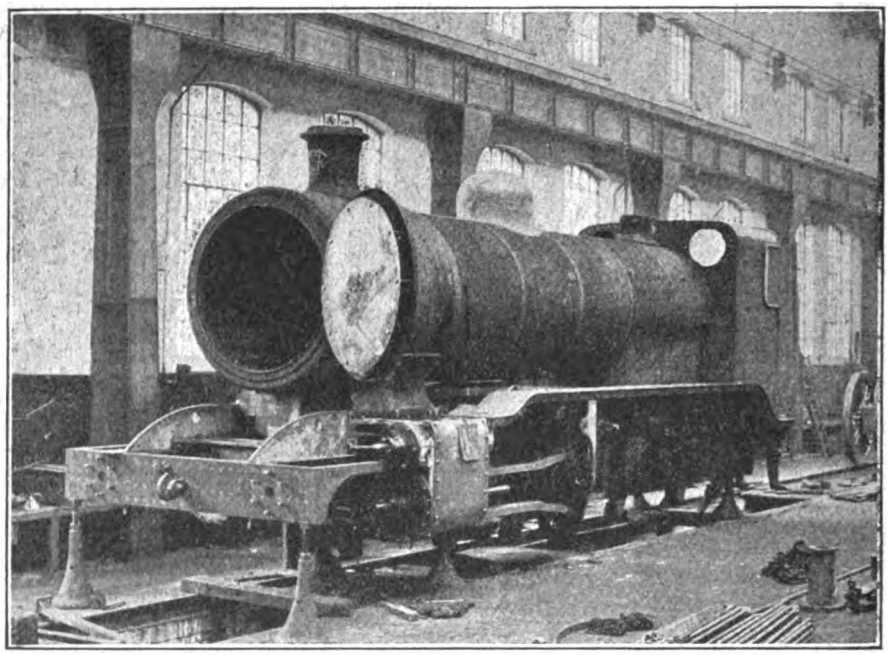
Wakefield mechanical lubricator in conjunction with which the anti-carbonising device introduced by the firm of Wakefield is also utilised.

The tender is of the standard Great Northern Railway pattern on six wheels of 4 ft. 2 in. diameter. The wheelbase is 13 ft. A water capacity of 3,500 gallons is provided and a coal capacity of 6½ tons. The tender is fitted with water pick-up apparatus. The engine is equipped with automatic vacuum brake fittings for the train and steam and hand brakes for engine and tender. Steam sanding gear is applied to the front of the driving wheels and ordinary gravity sand pipes to the leading coupled and trailing wheels.



READY FOR WHEELING.

Boiler, cab and other details have been added.

Two of the photographs taken in the works and reproduced in these pages by the courtesy of Mr. Gresley show the engine nearing completion. In one of these the boiler and cab are seen mounted in position but the engine still requires the wheels, motion and some other fittings. In another the engine is shown practically ready to leave the shops and have its boiler "steamed." The wheels, rods and valve motion have been added, brake fittings, buffers, etc., fitted in their respective positions, and the engine after a preliminary test of the boiler and a running test on the road will then be ready together with its tender for the paint shop.

The writer has made a few observations of the workings of these engines and noted one excellent performance with engine No. 1647 on a Leeds to London express leaving Peterborough at 10.26 a.m., this train running through to Finsbury Park, a distance, roughly speaking, of 73½ miles without a stop. The train is due at the latter point at 12.5 p.m. and King's Cross at 12.15 p.m. On the occasion noted it left Peterborough 4 min. late and arrived at Finsbury Park, dead on time, the average speed for the 73½ miles being thus slightly over 46·4 m.p.h. The load taken was twelve 8-wheeled vehicles well filled with passengers and luggage. The accelerative powers of the engine were demonstrated to advantage at starting and its general performance on the run, which includes several ups and downs, was really excellent. There is an up-grade extending 5 miles at 1 in 200 between Holme Junction and Abbots Ripton, and again from Arlesley to Stevenage, a distance of about 9 miles the bulk of which is at 1 in 200. The engine performed notably well on both of these

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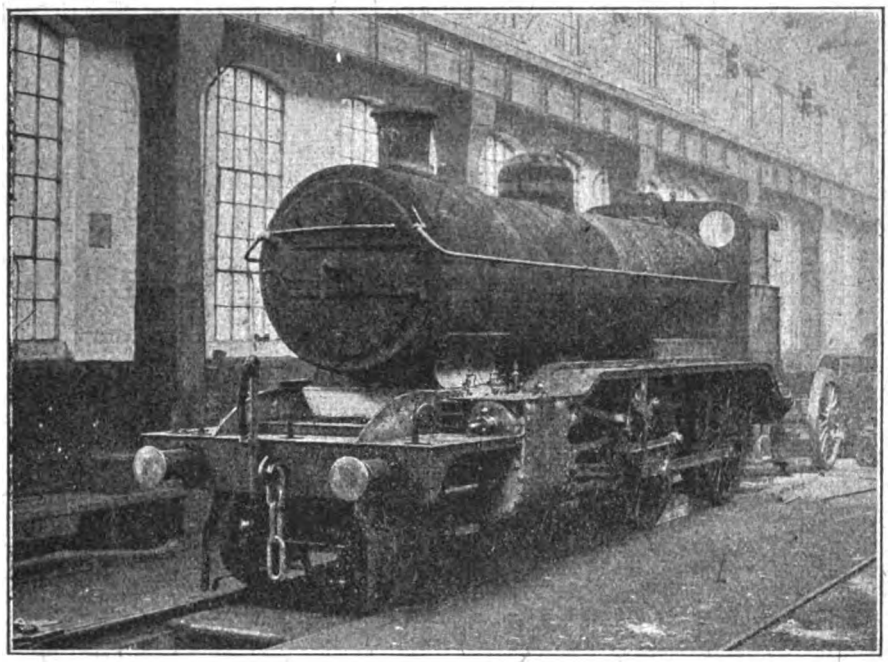
sections and ran very fast on the continuous down grade from Potters Bar to Finsbury Park.

A week later the writer noticed the same engine at Sandy, proceeding towards London with a heavy goods train weighing, exclusive of engine and tender, about 800 tons and has since ascertained that the locomotives of this class are frequently changed about from one class of service to another in this manner so that the claim that they are adaptable to the purposes of mixed traffic is fully borne out. The 1.35 p.m. slow passenger train from Peterborough is very frequently worked by an engine of the 2-6-0 type. It calls at all stations to New Barnet running thence fast to Finsbury Park and arriving at King's Cross at 4.17 p.m. There are 18 stops between Peterborough and New Barnet including one of 5 min. duration at Hitchin and the train is really a difficult one to work. Thus, as seen, the engines are to be found one day on a fast running express, another on a heavy goods train, and the third on a slow passenger train with many stops and restarts in the course of the run, and this wide variation in the working conditions is often extended further still by the assignment to the engines of such tasks as the handling of fast goods and perishable traffic, parcels trains and others running at varying speeds and under different conditions of one sort or another all of which they appear to be able to handle with ready facility.



LOCOMOTIVE COMPLETELY ASSEMBLED AND READY FOR STEAMING.

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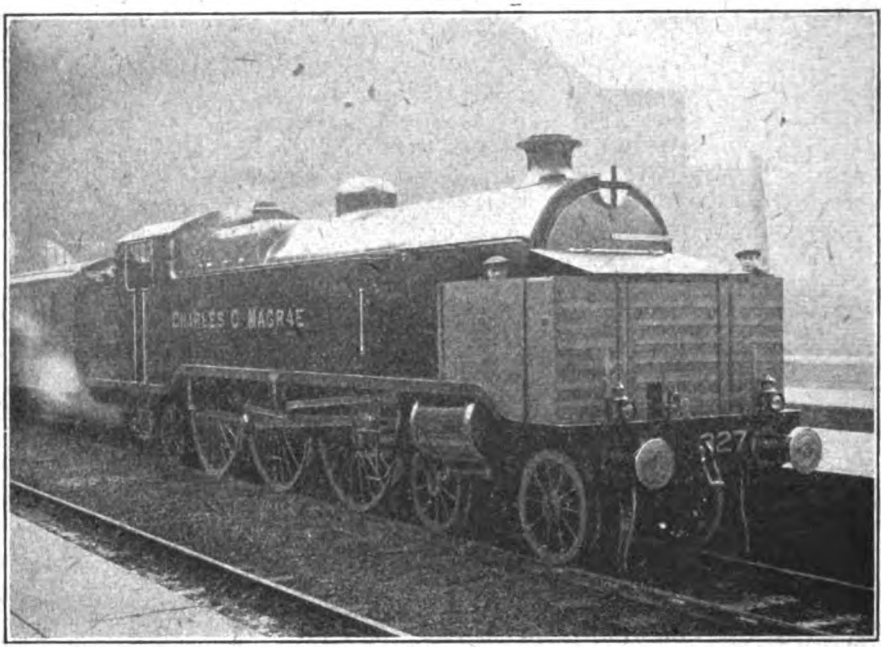
LOCOMOTIVE INDICATING SHELTERS.



INDICATING SHELTER ON LONDON, BRIGHTON AND SOUTH COAST RAILWAY LOCOMOTIVE.

WHEN new types of locomotives are being indicated, it is customary to provide a shelter for those engaged in taking the diagrams. This, as a rule, consists of a temporary wooden erection at the front end of the locomotive, and conforming with the particular requirements of the case.

Some of these shelters are of a more adequate description than others, and may consist of two separate enclosures, one on each side of the smokebox, or the whole of the forward portion of the running board may be boarded up, so that, in passing from one side to the other, the operators are afforded complete protection.

This latter style of shelter was adopted on the London, Brighton and South Coast Railway's Baltic type tank locomotive, *Charles C. Macrae*, and the accompanying illustration shows the engine thus equipped. Having travelled within the enclosure at very high speed, a RAILWAY MAGAZINE contributor states that it afforded all the protection required in what would otherwise have been a very exposed position. Small openings with glass discs are provided in the front portion of the boarding, so that it is possible to see ahead without looking over the top.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—
L. & N.W.: Jan., Feb., March, May, 1915.
Great Northern: June, July, 1915.
M.S. & L.: Aug., Sept., Oct., 1915.
Great Western: Nov., Dec., 1915; Jan., Feb., March, April, May, June, July, Aug., 1916.
Glasgow & S.W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916; Jan., Feb., March, April, May, 1917.
South Eastern: June, July, August, 1917.
Lancashire and Yorkshire Railway: Sept., Oct. and Nov., 1917.
London, Chatham and Dover Railway: Dec., 1917; Jan. and Feb., 1918.

In April, 1918, Mr. Ahrons will continue to deal with The Caledonian Railway.

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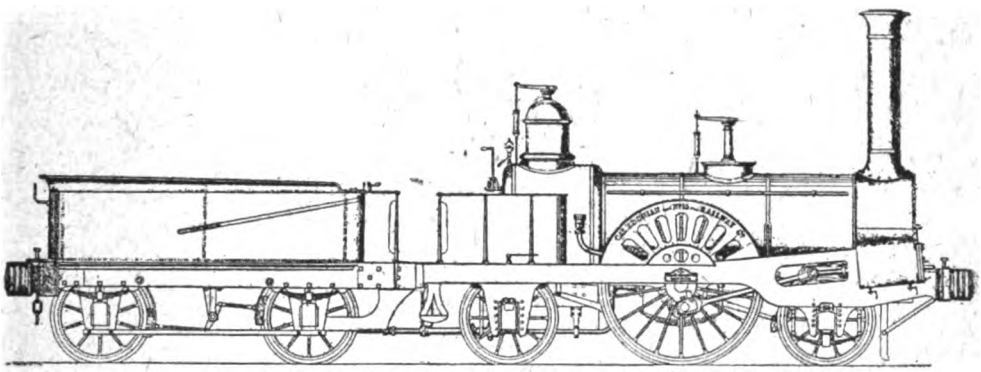
Locomotive and Train Working in the latter part of the 19th Century.

CALEDONIAN RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

UNTIL the year 1883 the general designs of the locomotive stock of the Caledonian Railway presented certain well-marked features and peculiarities that distinguished this line from most other railways. These may be divided under three heads :—

1. Outside cylinders were almost universal for all classes of engines. In fact, out of a total locomotive stock of 725 engines only 14 had inside cylinders, and these had been constructed for other companies, which had either been taken over, or the engines purchased by the Caledonian.



OUTSIDE CYLINDER PASSENGER LOCOMOTIVE, NO. 15.
Built 1847.
After Tredgold's "Steam Engine."

2. Almost the whole of the extensive goods and mineral traffic was worked by four-wheels coupled engines. Of the above 725 engines, only 44 tender engines had six-wheels coupled, and there were in addition 23 shunting engines also with six-coupled wheels. The six-coupled tender engines were employed almost entirely upon coal trains in the Glasgow district.

3. Although the Caledonian main line is, as far as gradients are concerned, one of the heaviest in the Kingdom, with long banks of 1 in 80 and 1 in 75 (up to Beattock) and 1 in 100, a very large proportion of, and most certainly the most important of the expresses were before 1884 worked by "single" engines of small tractive power, which had driving wheels of the extremely large size of 8 ft. 2 in.

It will be most convenient to begin by giving some account of the various classes of "singles." They, and it may be added also the whole of the Caledonian locomotives until 1883, owed their style and origin to an engineer who was himself never the chief of the locomotive department of this railway. I refer to Mr. Alexander Allan of the early Crewe days, who was afterwards associated with the Scottish Central Railway; a line amalgamated with the Caledonian in 1865. The first engines built for the opening of the Caledonian main line in 1847 were 6 ft. singles with 15 in. by 20 in. cylinders and 90 lbs. pressure, constructed entirely from drawings supplied by Mr. Allan from Crewe Works. They were built by Messrs. Jones and Potts and The Vulcan Foundry Co., both firms being established at Newton-le-Willows, near Warrington. A number were also built subsequently by the Caledonian Railway at their old works at Greenock. Nearly all these engines had disappeared by

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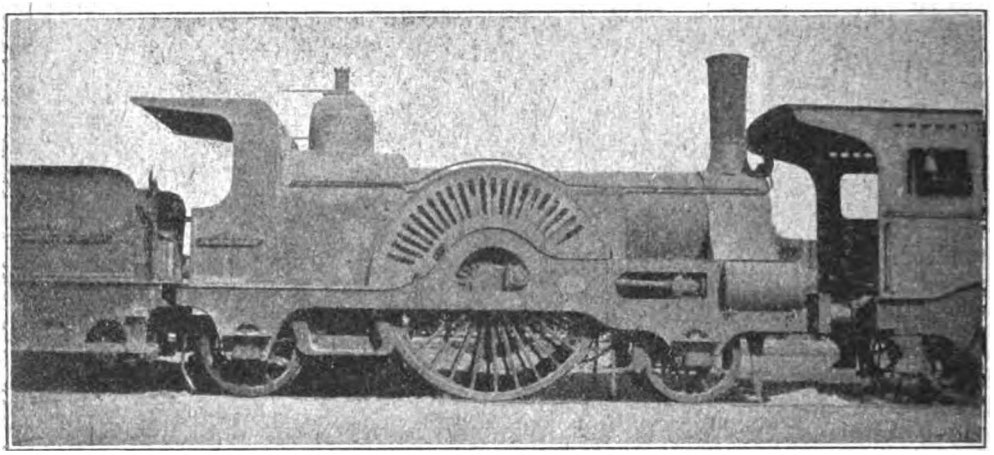

CALEDONIAN TYPE 8 FT. 2 IN. SINGLE.
As built by Neilson and Co., 1862, and sold to the Egyptian Government Railways.
Photographed at Cairo, 1895.

1877, though one solitary survivor by Jones and Potts, which had been re-numbered 723, remained in existence until about 1880. I believe that in 1849 these old engines had one of the fastest runs in the country, viz.: from Edinburgh to Carstairs, 27½ miles in 32 min., a speed of 51½ miles per hour. The load was usually only four light four-wheeled coaches, under 30 tons total, and it was stated that time was very rarely kept. The line is mostly uphill, with banks of 1 in 100, 1 in 115, 1 in 120, etc.

A traveller from Birmingham to Aberdeen in the period 1853 to 1860 or later passed over the lines of five companies, the London and North Western (Northern Division), Lancaster and Carlisle, Caledonian, Scottish Central, and Scottish North Eastern Railways, and would almost always have made the whole journey behind engines of Mr. Alexander Allan's designs, from which almost the whole of the locomotive stocks of these companies had been built. Mr. Allan left Crewe in 1853 for Perth, where he took charge both of the general management and the locomotive department of the Scottish Central Railway. He left the service of this company at the end of 1865, on its amalgamation with the Caledonian.

The most famous of the Caledonian "single" express engines were the celebrated "eight-footers." But before giving my account of them I am going to descend into the depths of historical iconoclasm, and in so doing it is possible that I may be heterodox enough to damage some long cherished locomotive idol. The Caledonian 8 ft. singles have always been stated to have been built to the designs of Mr. Ben Connor* for twenty years (1856–1876), chief locomotive engineer of the Caledonian. I have before me as I write these lines an original letter written in 1891 by the late Mr. Alexander Allan, and from it I quote the following sentences verbatim:

"As to the Caledonian engine I say it was no new design. I was paid for the design by the Caledonian Railway Company, and it is of smaller wheel than the Crewe engine *Cornwall*, and only 1 foot larger than *Velocipede* and *Courier*.† When near Glasgow I called on Mr. B. Connor at the Caledonian Railway Works, where I met Mr. Patrick Stirling, then on the Glasgow and South Western Railway, and one observation passed from Mr. Stirling, which was the smallness of the axle for the 8 ft. wheels. I afterwards heard they had all broken."

I make little comment on Mr. Allan's letter, as I possess no information which could throw any independent light upon the matter, beyond the fact, patent to every locomotive engineer, that the whole design was at least obviously derived from the early Crewe practice started by Mr. Allan. I might, however, add that the valve gear throws no definite light upon the origin of

* They are thus described in Colburn's "Locomotive Engineering."

† These two London and North Western Railway Crewe-built engines had 7 ft. driving wheels. The *Courier* was a Crampton (E. L. A.).

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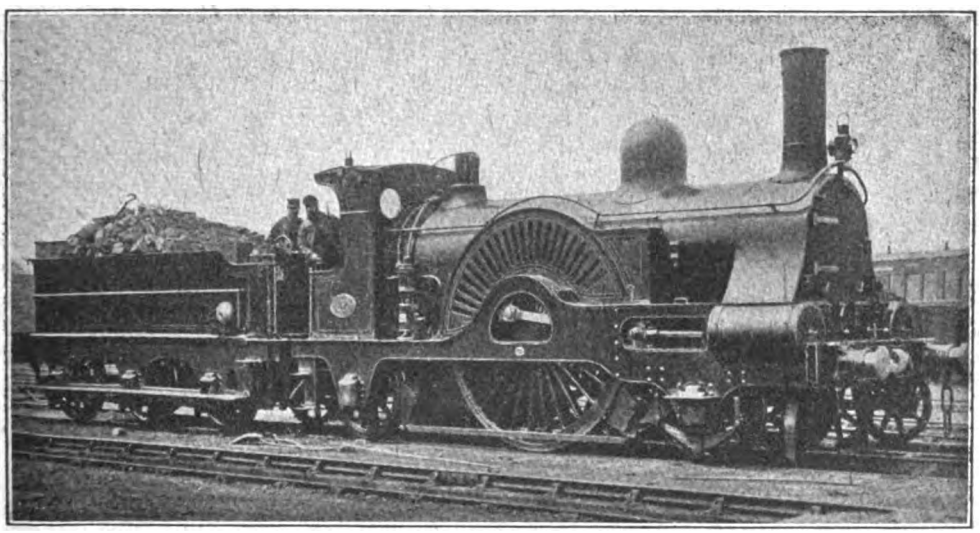
the design. The 8 ft. singles—as illustrated in Colburn's "Locomotive Engineering"—had Gooch's fixed link, which I believe was selected partly to keep the centre line of the boiler as low as possible.* It might naturally be thought that Allan's straight link motion would have appeared in an engine of his design, but, on the other hand, the 6 ft. singles which he certainly designed at an earlier date for the Caledonian had Stephenson's link motion. The latter, however, were built before the straight link motion came out.

It may also be of interest to quote from Colburn's "Locomotive Engineering" part of the description of the 8 ft. 2 in. singles written by the late Mr. D. K. Clarke. "This class of engines were designed with a view to economy rather than speed, and are employed on main line service between Glasgow and Carlisle, taking their turn on all the trains, fast and ordinary. The experience that had previously been acquired of the durability and general economy of the 7-ft. driving-wheel over the original 6-ft. wheel passenger engines of the line, suggested to the designer that a further enlargement of the driving wheel would be advantageous and satisfactory. . . . This engine has grown out of the old Crewe pattern of engine originally introduced on the Caledonian line by Mr. Locke, the chief engineer, and successively modified by Mr. Robert Sinclair and by Mr. Connor, to meet the growing requirements of the traffic. The largeness of the driving wheel may prevent in some degree the injurious effects of concentrated loads on the permanent way. . . . . The framing of the old Crewe engine is retained in this one, giving outside bearings to the fore and hind axles, and insides to the driver. . . . With outside cylinders it may very properly become a question whether the cylinders should be, as they are in the Caledonian engine, so rigidly united to the outside frame plates, which carry two pairs of wheels and axles, and which of course transmit the shocks of the road to the cylinders."

The first two of the 8 ft. singles were built at St. Rollox Works in 1859, and ten others followed at intervals from 1861 to 1865, the batch of twelve being numbered 76 to 87. The driving wheels had a diameter of 8 ft. 2 in., but the leading and trailing wheels were only 3 ft. 8 in. diameter The cylinders were 17½ in. by 24 in. (originally 17 in. by 24 in.), though a few of them were subsequently bored out in service until they reached 18 in. or thereabouts. The boiler pressure was 120 lbs. when they were first built, but subsequently I believe it was increased to 140 lbs. in some of them when the boilers were renewed in 1868 to 1872. The original 1859 boilers had domes with

* The centre of the boiler was only 6 ft. 6¾ in. from rail level in spite of the large diameter of the driving wheels.



Photo] [*Locomotive Publishing Co., Ltd.*

8 FT. 2 IN. SINGLE, NO. 87.

Rebuilt at St. Rollox, 1872, and slight modifications made by Mr. Drummond, 1883.

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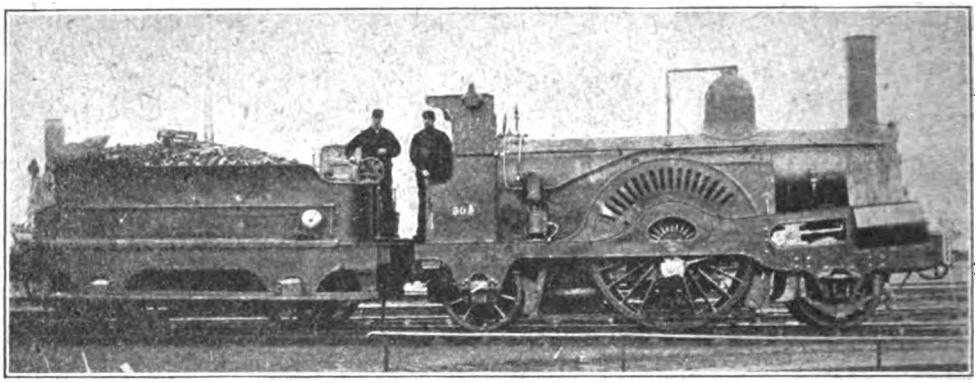

SINGLE EXPRESS ENGINE (CONNOR).
Built at St. Rollox, 1865. Wheels, 7 ft. 2 in. Cylinders, 17 in. by 22 in.

spring balances over the raised fireboxes, but the later flush-topped boilers had plain round topped domes placed just in front of the driving wheels, and Ramsbottom valves. The heating surface of the original boilers was only 1,172 sq. ft., increased in some of the rebuilds to 1,190 sq. ft. The weight was only 30 tons 11 cwt., of which 14 tons 11 cwt. rested on the drivers, but I think the weight must have been increased after the rebuilding, for I have a record of No. 86 which in 1882 weighed 32 tons 16 cwt. with 15 tons 10 cwt. on the drivers. Four additional engines of the same class, Nos. 113 to 116, were built at St. Rollox in 1875; these had the domes placed rather further back nearer the firebox than in the case of Nos. 76 to 87. The heating surface of 113–116 was, however, only 947½ sq. ft.

It is hard to conceive of an express engine which from its abnormal dimensions would seem to have been more unsuitable for the heavy gradients of the Caledonian main line, but it must be admitted that these engines could take rank amongst those whose performances on the metals belied all theory on the subject of insufficient tractive force. It was possible to "prove" a great many things that the engines could not do, but then they calmly proceeded to knock all the proofs to bits by doing some of the very things that by all the canons of locomotive orthodoxy they had no business to be capable of doing. Nevertheless, they had their limits.

Three similar engines were built by Messrs. Neilson and Co. for the Egyptian State Railways, one of which was exhibited at the London Exhibition of 1862, where it attracted the attention of Saïd Pasha, then Viceroy of Egypt, who wanted an engine to convey him at 80 miles an hour.* Saïd was somewhat of a connoisseur in locomotives, and was also an ardent collector of anything in that line that took the viceregal eye. So he came over in state and bought up half the locomotives in the exhibition. I saw a great deal of the three 8 ft. singles in Egypt, and was present at their final obsequies. The annexed illustration shows the unchanged Exhibition engine as it stood in the scrap siding at Boulae, Cairo, a few days before its demise in 1895.

Returning again to the Caledonian engines, the 16 "eight-footers" took charge of the fastest and heaviest main line trains until 1884–5, when they were gradually replaced by Mr. D. Drummond's coupled bogie engines. Nos. 76, 77, 82, 85, 86, 87, 115 and 116 were stationed at Glasgow and ran to Carlisle, whilst at the Carlisle end there were Nos. 79, 80, 81, 83, 84, 113 and 114. The remaining engine No. 78 was quartered at Edinburgh. They always took a pilot engine up the Beattock bank, and nearly all the expresses with the exception of the early morning down "Limited Mail" (4.18 a.m. from Carlisle) stopped at Beattock to attach the pilot. The "Limited Mail" had no time to worry about a Beattock stop, and consequently took two engines, both of which were frequently 8 ft. singles, right through from Carlisle.

The work of the 8 ft. singles was confined to the Carlisle–Glasgow section, with one or two turns to Edinburgh. I do not think they ran to Perth unless with the "Limited Mail" at those times when this train was not worked by a Perth engine. In those days

* Saïd did not attain his wish; he forgot the state of the old Egyptian permanent way with its mud ballast.

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the method of working was that a four-coupled engine left Perth with a combined Glasgow and London train, and at Glenboig the London portion was detached, and the Perth engine worked forward with the Glasgow portion to Buchanan Street. An engine of any class that was handy took on the London portion to Law Junction or to Carstairs, where the Glasgow train with an 8 ft. single was coupled to it. The Edinburgh portion for the south was attached at Carstairs, and at a later date at Strawfrank Junction. At one time the Carlisle trains departed from Buchanan Street, but were afterwards diverted to Central station.

The "Limited Mail" in 1876–7 was the fastest train. It then left Carlisle at 4.26 a.m. and reached Edinburgh at 6.50 a.m., with a 3-min. stop at Carstairs to detach the Glasgow portion. The average load was then 10 coaches. In April, 1877, it was accelerated from London and the load increased to 12 (very frequently 13) coaches. But the Caledonian share of the run was a "deceleration," for by leaving Carlisle at 4.18 a.m. and reaching Edinburgh at 6.45 a.m., it took 3 min. longer over the northern portion of its journey. It ran from Carlisle to Carstairs—73½ miles—without stopping in 96 min.

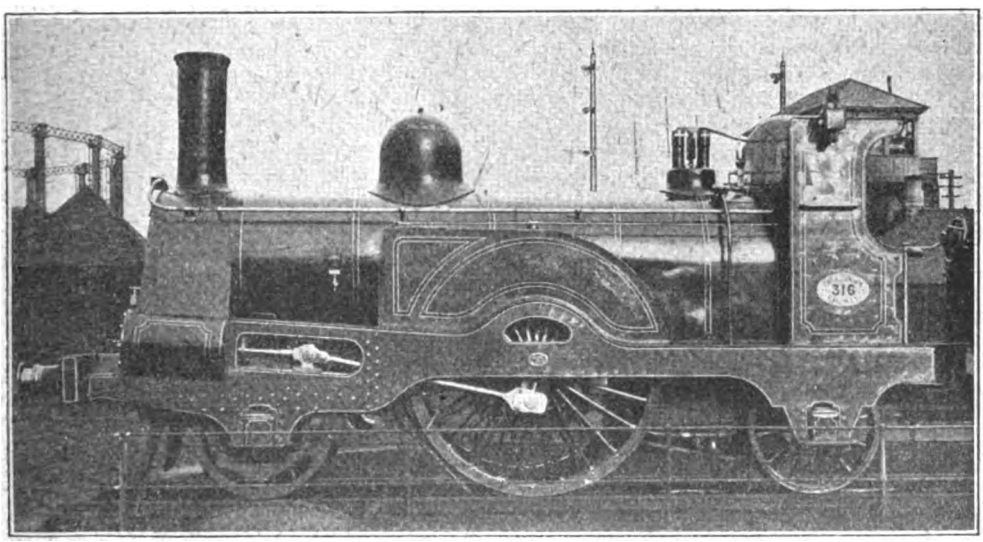
In 1880 the 10.0 a.m. Scotch express from Euston was divided at Carlisle, and the Glasgow portion left at 5.28 p.m., and Beattock, where it stopped, at 6.20 p.m. The Edinburgh train left Carlisle at 5.40 p.m., Lockerbie at 6.14 and Beattock at 6.33 p.m.

The up 10.0 a.m. from Glasgow departed from Carstairs at 10.57 a.m. and ran through to Carlisle without stopping in 98 min. There were also two other through runs from Carstairs to Carlisle each of which was booked to be done in 102 min.

Although "double heading" was very usual from Carlisle to Carstairs or Beattock Summit, the heaviest trains were taken thence to Glasgow on the downhill run by only one "eight-footer." On one occasion in 1881 No. 77 brought in the first portion of an express from Carlisle with 23 coaches.

The "Limited Mail" mentioned above was not, however, always run by 8-ft. single engines, but for some time was worked by Perth engines and men, the engines being 7 ft. 2 in. coupled. I shall, however, mention these later.

In going through my notes I regret that I can find no records of actual runs made by these celebrated engines, nor can I find any particulars amongst the notes given to me by the late Mr. Rous Marten. The reason is that the year 1884, when most of my own timings began to be made, was also the time when Mr. Rous Marten commenced his first series of observations, and in this year the eight-footers were superseded on the best



SINGLE EXPRESS ENGINE (SERIES 312–319).

Built by The Vulcan Foundry, 1865–6, for the Scottish North Eastern Railway and rebuilt at St. Rollox. Wheels, 7 ft. Cylinders, 16½ in. (some 17 in.) by 22 in.

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expresses by Mr. Drummond's 6 ft. 6 in. bogie engines.

But although they were gradually withdrawn from the main line, the old engines remained in service on secondary trains in the Perth and Callander districts for some years afterwards. In 1893 when I was living abroad I received a letter from a friend in Sheffield who was then inspecting material for one of the English railways. He wrote: "The Caledonian 8 ft. 2 inchers, of which you have one or two in Egypt, still 'hang out' in Scotland. Bessemers had an order for four tyres for them a few weeks ago, and I saw them rolled and rejoiced, but the leading roller didn't, he d——d around, for such odd sizes are no profit to him and only hinder regular work." Which shows that 8 ft. wheels have unsuspected drawbacks. Two of the "eight-footers" were concerned in a disastrous collision at Lockerbie in May, 1883, which was primarily due to the station-master at that place having a little plan of his own for expediting the station work. The Dumfries branch trains were usually run in on the down side of the station, but on this particular train, in order to avoid delaying the up Perth express, the station staff used to signal it in by hand onto the up side, so that it had to cross the down line. On the night in question it fouled the junction and collided with a down goods train from Carlisle to the north. This collision also blocked the up line, and the up West Coast Mail which left Glasgow at 9.15 p.m. drawn by the two 8 ft. singles 84 and 78 came on at a great speed towards the obstruction. When within about 350 yards of the home signal, this was suddenly thrown up to danger, but the mail could not be stopped, and dashed into the block with disastrous results, the driver and fireman of the leading engine and several passengers being killed.

The mail was fitted with the obsolete Clark and Webb chain brake, available only on the three front and four rear coaches; otherwise had a good continuous brake been in use, it is likely that the train would have been saved. The brake deficiency, it is but fair to say, was not the fault of the Caledonian Company, as they had drawn the attention of the London and North Western Railway to the defects of the chain brake on the West Coast expresses, and they themselves were fitting their trains with the Westinghouse. But the Clark and Webb chain brake was a protégé of the English company, which the chairman, Sir Richard Moon, who for a number of years shed his refulgent beams on the half-yearly meetings of that line, was wont to describe as a sort of "ne plus ultra" in the matter of continuous brakes, and so it would appear that the Caledonian warnings went unheeded.

In regard to continuous brakes the Caledonian Railway was in reality the pioneer British railway, and from the very beginning has always been an air brake line. As early as October, 1871, a four-coupled express engine, No. 92, followed in March, 1872, by a sister engine, No. 95, were both fitted with the old Westinghouse non-automatic air brake. Some years afterwards the non-automatic brake was changed for the Westinghouse standard automatic pattern.

The Caledonian also introduced another form of air brake, the name of which will hardly be remembered by railwaymen of to-day. This was the Steel McInnes compressed air brake, and a Caledonian engine and train so fitted were present at the Newark brake trials of 1875. This form of brake had the defect of using an enormous amount of air at each application; all the brake cylinders and brake pipe had to be emptied, and an unavoidably slow action was the result.

Mr. D. Drummond on taking charge of the locomotive department in 1883 introduced a few modifications into the 8 ft. singles such as 76, 78, 84, 114 and 116, and in so doing the valves were reset. It must be admitted that this change was for the worse, as the engines were never so well liked afterwards, and it was stated that they did not steam so well. When an old engine is doing its work satisfactorily, "let well alone" is a very good motto. The last survivor of the class was old 115A, which in its last declining years was renumbered 1228, and went to the scrap heap in 1901. It seems a pity that one of the old engines was not preserved.

The engines just described were by no means the only "singles" possessed by the Caledonian. As a matter of fact there were no less than 43 other tender "single" engines, and one tank engine. All except two of the tender engines were of the "Allan" or enlarged "Allan" type with outside cylinders. Of these there were two classes with 7 ft. 2 in. and 7 ft. wheels that had been the earlier main line express engines. No. 65 to 75 with 7 ft. wheels and 16 in. by 20 in. cylinders owed their origin to Mr. Robert Sinclair, who built them in 1854-5 at the Company's works at Greenock before he became chief locomotive

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engineer of the Great Eastern Railway. They were subsequently reboilered by Mr. Connor, and Nos. 67, 68 and 69 were quartered at Carstairs to run the Edinburgh portions of the main line trains from that place. Nos. 65 and 66 were at Beattock working on the Dumfries trains in the early 'eighties. The four engines Nos. 88 to 91 were larger, with 17 in. by 22 in. cylinders and 7 ft. 2 in. wheels, and were contemporaneous with the 8 ft. engines, having been built at St. Rollox in 1864–5. For some years they took their turns on the main line trains, but in 1875 they were superseded on this service by the later 8 ft. singles 113 to 116. After this they joined 67 to 69 at Carstairs to work the Edinburgh portions of the main line expresses. One of them No. 90A, is illustrated on page 154. All these engines also worked certain slow trains to Glasgow in the early 'eighties, but after leaving Carstairs Nos. 89 and 90 found a home at Montrose, and worked daily from there to Dundee and back for some years.

There were also ten other 7 ft. singles, of which eight had been built by The Vulcan Foundry, of Newton-le-Willows in 1865–6, for the old Scottish North Eastern Railway, which was amalgamated in 1865 with the Caledonian. The Scottish North Eastern line was itself an amalgamation of various railways between Aberdeen, Montrose and Perth. The eight engines in question had cylinders 16½ in. by 22 in., though several had been enlarged to 17 in. by 22 in., and they were of the same general enlarged Allan type as those of the Caledonian. In their early days I believe they worked main line trains between Aberdeen and Perth, but in the later period with which I am dealing they had been transferred to Carstairs, where many of the Caledonian "singles" seemed eventually to find a home. At Carstairs these engines Nos. 312 to 319 were principally used for piloting work. They were not very great favourites with the men, for they were very "rough riders," and their springs were shorter than those of the Caledonian singles. The drivers used to term them the "Hielandmen," and they finally disappeared in the early 'nineties. The last survivor was I believe 316, which was renumbered 1231, and having migrated northwards again was finally working on the Dundee and Perth and Dundee and Montrose sections. The other two 7 ft. singles had at one time been interesting engines. One, No. 311, was a converted and rebuilt Crampton that, I think, had originally done duty on the Dundee and Arbroath Railway. This disappeared from service about 1881, but the other engine No. 310 originally built by Messrs. Barclay and Co. in 1872 was a much more modern engine and lasted until nearly the end of the century. No. 310 had 7 ft. wheels and 16½ in. by 22 in. cylinders, and in its early days was remarkable for having been fitted with a patent arrangement for lifting the driving wheels clear of the rails when "coasting" down a bank, the idea evidently being to let the engine run as a four-wheeled vehicle, and save unnecessary movement of the pistons, connecting rods, and motion. How long the engine existed with this "contraption" I do not know, but it seems to have been removed at an early date. Eventually 310 migrated to Carlisle, where it was employed for some time as an odd-job and pilot engine, and finished its days as No. 1230.

There were also a number of 6 ft. singles of Mr. Allan's design, almost similar to the old engines with which the Caledonian started work in 1848. The engines to which I refer came from the Scottish Central Railway, whose headquarters were at Perth, where the locomotive shops were under Mr. Allan's superintendency until the amalgamation with the Caledonian in 1865. They were small engines with cylinders only 16 in. by 20 in., and on the Caledonian became Nos. 294 to 299 and 306 to 309. I have no certain knowledge of the work of these engines, but I believe the majority ran on their old line with lighter and branch trains. Six other Scottish Central single engines with 6 ft. wheels and 16½ in. by 22 in. cylinders, also by Mr. Allan, were of somewhat later date, and were built by Messrs. Sharp, Stewart and Co. in 1864. The boilers of these engines were somewhat more generous in the matter of heating surface than those of the Caledonian engines, and had 1,079·2 sq. ft., of which the firebox, which had a midfeather partition, provided 115·2 sq. ft. Of the above Scottish Central "single" engines, two, Nos. 294 and 304, eventually got to Carstairs shed, and in their declining days were used for piloting goods trains in this district. There were two other Caledonian "singles" of quite a different species to which I shall refer later.

(To be continued.)

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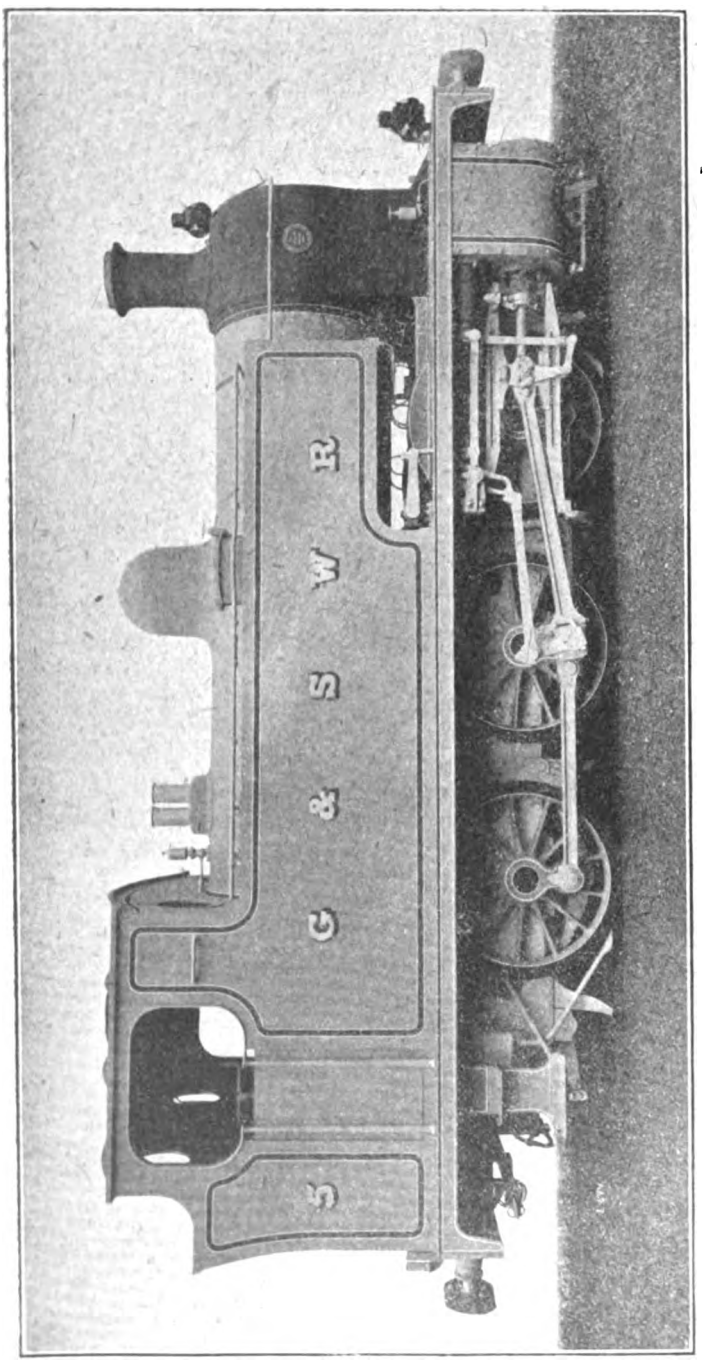
Glasgow and South Western Railway New Tank Locomotives.



THREE new shunting locomotives of the 0–6–0 type have recently been introduced on the Glasgow and South Western Railway by Mr. Peter Drummond, Chief Locomotive Engineer.

The engines, which are numbered 5, 7 and 9, are intended for use on colliery branches having curves of short radius, and also in dock and harbour sidings.

Leading particulars are :

Cylinders, 17 in. diam. by 22 in. stroke.
Wheels, 4 ft. 2 in. diam.
Wheelbase, total, 10 ft.
Heating surface, total, 838 sq. ft.
Grate area, 17·15 sq. ft.
Working pressure, 160 lbs. per sq. in.
Tank capacity, 1,020 galls.
Fuel space equal to 35 cwt.
Distributed weights :—Leading wheel, 12 tons 10 cwt. ; driving wheel, 13 tons 19 cwt. ; trailing wheel, 13 tons 11 cwt. Total, 40 tons.

Outside cylinders are employed driving the intermediate wheels, which are flangeless. Steam distribution is effected by means of balanced slide valves of the "Richardson" type, working above the cylinders, and actuated by Walschaerts' valve gear. The steam-chests are lubricated by a mechanical lubricator of the "Eddlewood" type, worked and controlled from the valve gearing. An automatic vacuum brake is used.

The three locomotives were constructed at Hyde Park Works, Glasgow, by the North British Locomotive Company, Ltd.

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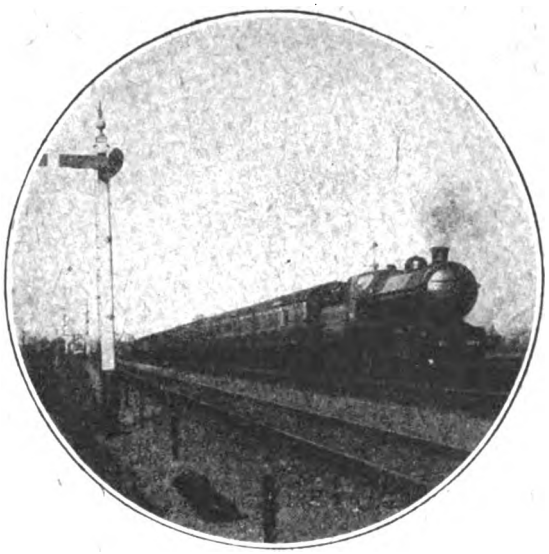
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

2-6-0 type engine No. 1648 on up Leeds express, Peterborough-Finsbury Park non-stop, passing Sandy at 50 miles per hour.

EVIDENTLY the question of compound *versus* simple propulsion in locomotives is one of considerable interest to many readers, if the interesting letters which I have received since writing the articles on this subject in the October, November and December issues of last year are any indication of the general feeling, and from certain of these communications I wish to quote forthwith. In the first instance, Lord Monkswell, from whose twin volumes "French Railways" and "The Railways of Great Britain" I extracted for purposes of comparison certain of his experiences with the 4–6–2 express engines of the Northern Railway of France, writes as follows concerning locomotive performance: "It appears to me that a comparison of calculated horse-powers is, in the absence of particulars of indicated horse-powers, by far the most convincing test to apply. It is a method which I always use myself, employing the very simple Deeley formula: $R = 3 + \frac{v^2}{290}$. In the case of work done on steeply rising gradients, where a very large part of the resistance is that due to gravity, and therefore exactly ascertainable, the comparison gives very little opportunity for error.

"It is, for instance, easy to calculate very closely the horse-power developed by the Nord 4–6–2 engine 3.1157 at 56½ m.p.h. at the top of the Caffiers bank and that developed by the London and North Western 4–6–0 engine at 46½ m.p.h. on 1 in 106 on the ascent to Grayrigg"—as detailed in my November article. "The total weight of the train, including engine and tender, in the former case must have been almost 405 tons and in the latter about 420 tons, allowing in both cases for the fact that the tender was only partly full. The resistance per ton of the French train was 32 lbs. (18 lbs. due to gravity + 14 lbs. due to velocity); that of the British train was 31½ lbs. (21 lbs. + 10½ lbs.). Total tractive effort required to keep the two trains going at their respective speeds was therefore very nearly the same, and the horse-power developed was in proportion to the speeds, say 2,000 for the French engine and 1,700 for the British engine." The horse-powers developed per ton of engine weight are even closer, being 23·5 in the case of the Nord locomotive, and 22·1 in that of *Sir Gilbert Claughton*.

"In the description of the performances of the Paris, Lyons and Mediterranean 4–6–2 engines which appeared in *The Locomotive*, there were particulars of horse-power presumably taken from indicator diagrams, which, so far as I can remember, showed a maximum of something over 2,400. My calculations give a maximum of about 2,250 h.p. for the performance of the Nord engines observed by me. These engines are about 6 tons lighter than the Paris, Lyons and Mediterranean engines, so the results agree very well, and tend to confirm the reliability of

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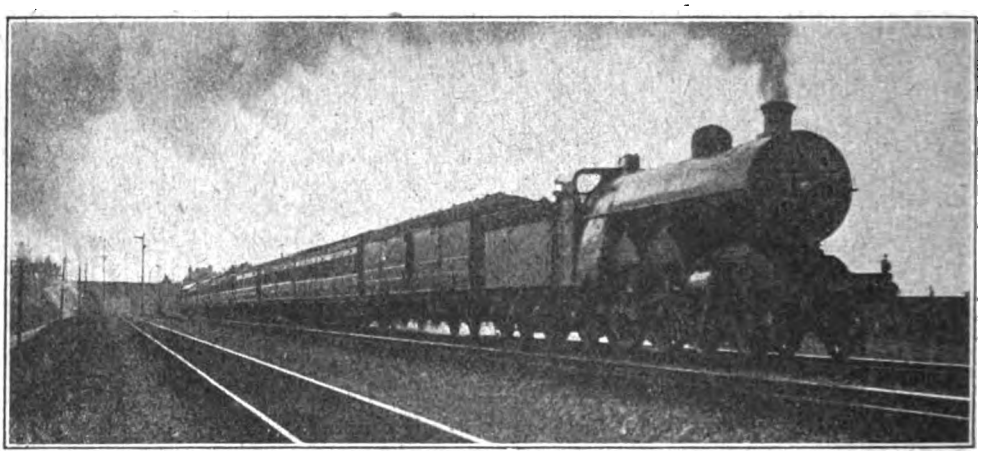
the calculations." In point of fact the Nord 4–6–2's weigh, without tender, 85 tons each in working order, and those of the Paris, Lyons and Mediterranean Company 93¼ tons, so that the maximum horse-power per ton exerted by the former was 26·5, and by the latter 25·7. "Calculation from the Deeley formula gives about 2,100 h.p. as the effort developed by the Great Western Railway 4-cylinder 4–6–0 engine *Lady of Provence* at 80 m.p.h. in the run described in your articles," Lord Monkswell continues. In this calculation, however, I hardly think he can have taken into account the slight falling grade of 1 in 754 on which this speed was attained, and this is confirmed by his subsequent remark. "This and other Great Western performances on the level give higher results than the best Great Western work uphill. A possible explanation is that, on a road so good as that of the Great Western Railway, the resistance is smaller than that corresponding to the average represented in the Deeley formula." In any case, however, from the performance standpoint there does not appear to be much to choose between the work of the British and the French engines, although as regards the former it must be admitted that the feats cited were more exceptional in relation to the average performances of the lines concerned than those detailed behind the French locomotives.

From this aspect of the discussion I pass to a letter from an American friend, lately on active service with the French Army, and now with our own, who writes most interestingly on probable reasons for the successful working of the French compounds. "In France, with the system of premiums," he says, "the men prefer a compound, which, if properly handled, can effect a greater saving than a simple over the allotted ration of coal. Thrashing has not the same effect on the fire as in a simple, *i.e.*, drawing out through the tubes unconsumed particles of fuel, so that the crew reap a greater profit when fast uphill work is required to make up time (for the men are fined for loss of time occasioned by themselves, and receive a premium for making up time lost from causes over which they have no control) or when extra train tonnage is hauled, for which another premium is granted." It is a pity that some similar system does not obtain over here, seeing that the reduction of maintenance and fuel costs to a minimum, as encouraged in the granting of a coal bonus without corresponding bonuses for regaining time or hauling abnormal loads and penalties for avoidable lost time, is not an incentive to punctuality. There is little doubt that a system such as that outlined by my correspondent would, if adopted, reveal unsuspected possibilities of haulage in many of our large modern express locomotives.

"In the second place," he continues, "every French driver has served two years as a fitter's helper before becoming a fireman. This undoubtedly makes the average French driver better than the average English driver, especially in hauling and caring for



Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

8.45 a.m., *ex*-King's Cross, north of Sandy. Superheater 4–4–2, engine No. 1407.

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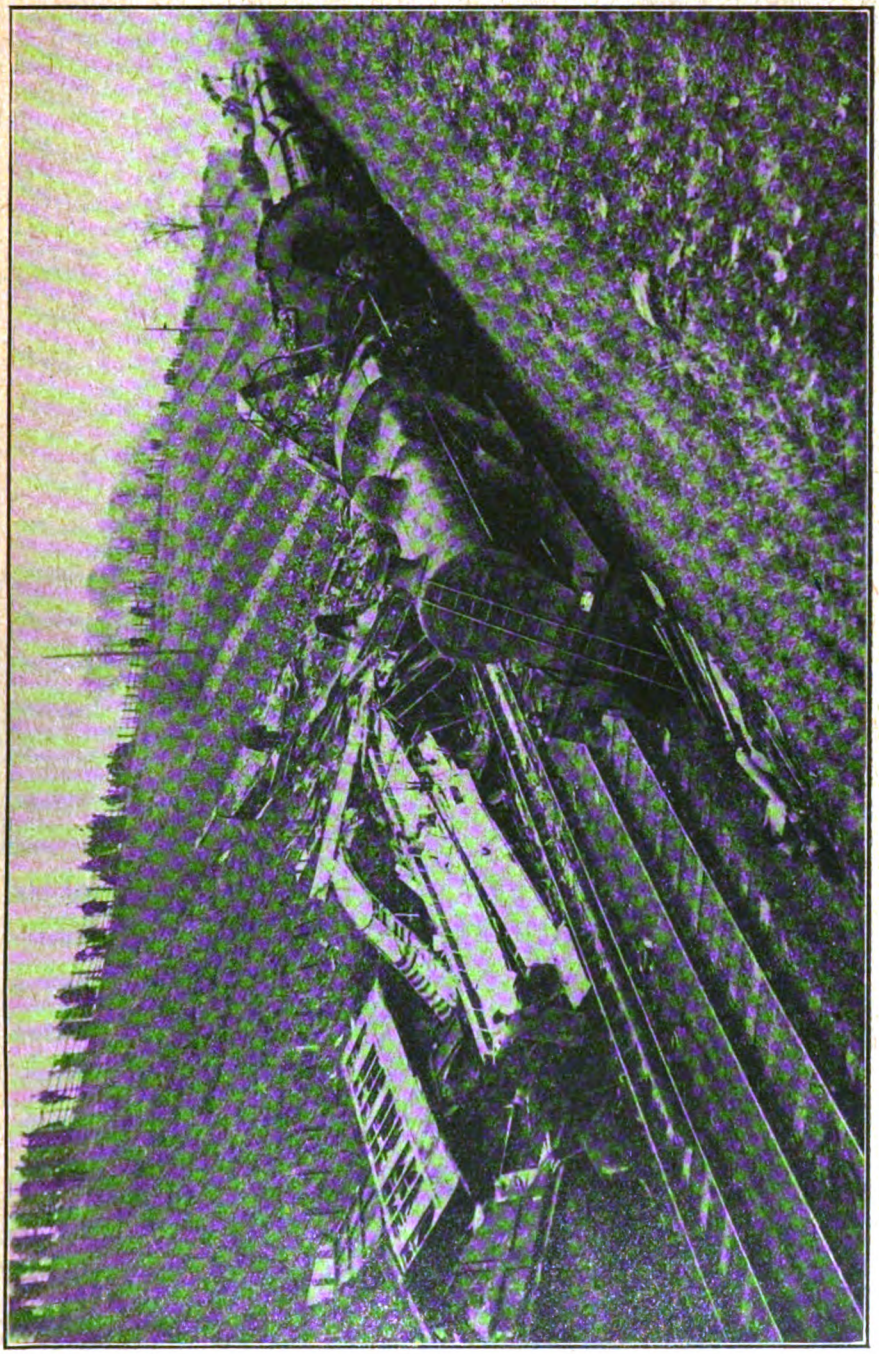

[Photo] [Topical.

MIDLAND RAILWAY.

The landslip at Little Salkeld, January 19th, 1918. The derailed express, 4–4–0 compound locomotive No. 1010.

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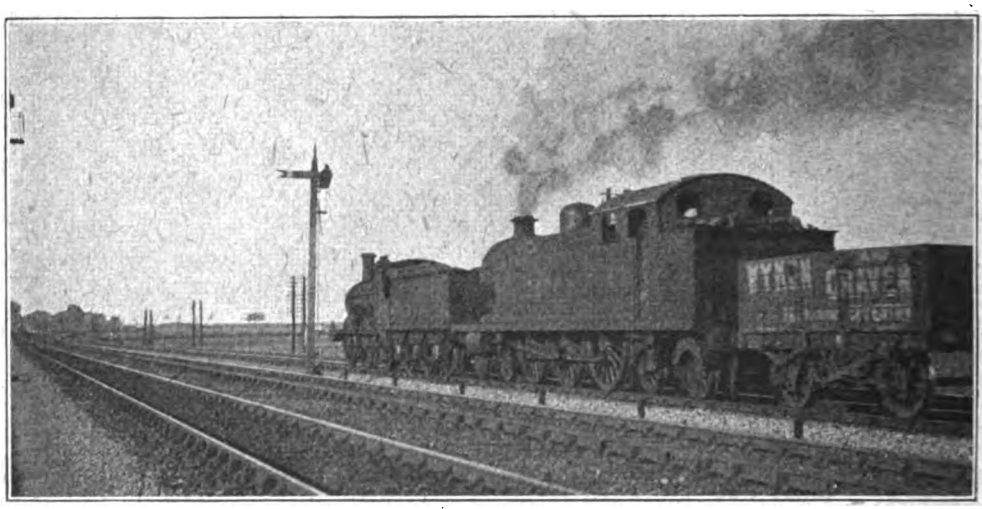
a compound. Thirdly, the French do not in the least object to complications, while the English and Americans do." An examination of a characteristic French footplate—say that of a standard Paris, Lyons and Mediterranean 4-cylinder compound superheater 4–6–2, with its fifty odd fittings and appliances — is ample proof of the last-mentioned contention, although in justice to the designer it must be explained that no more conveniently-arranged footplate exists when its complications are fully understood. From these points my friend deduces that compounds will never be as successful and therefore as widely used in England or the United States as in France.

to be capable of applying a sub-conscious knowledge of mathematical theory to every-day work on the road. By this I do not mean for a moment to cast discredit upon the British way of looking at these things, but only to suggest that our seeming peculiarity in adhering so firmly to the simple principle is only to be expected as the outcome of a national characteristic—a preference for the obvious or simple method, and a tendency to overlook a perfectly logical alternative, perhaps because it *is* logical!"

The characteristically British view of looking at things to which my friend has just referred is curiously confirmed by a letter from a Canadian correspondent now on service over here with the Canadian



Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

Down coal train between Bedford and Oakley. Train engine is 4–6–4 type, originally built for express passenger traffic on the London, Tilbury and Southend Railway. Pilot engine is 0–6–0 type, class 2.

Similar arguments are advanced in a letter from another correspondent who has made a close study of locomotive design and working on both sides of the Channel. "The Frenchman, whether he be designer or driver," he remarks, "is essentially much more of a mathematician than his English *confrère*. He gives a place in his mind to mathematics which few Britons would aspire to. And here I venture to think that we have the germ both of the success and of the use of the compound principle in France. The de Glehn system was thrashed out by sound and advanced mathematical methods long before it came to putting the results obtained (on paper, I mean) into practice. And as regards daily use, the French driver appears

forces. "It is a pity," he writes, "that you have not been favoured with notes of the performances of the Buenos Ayres Great Southern 4–6–0 4-cylinder compounds, as they have been superseded by 2-cylinder simple 4–6–0 engines. The de Glehn 4–4–2 on the Pennsylvania Railroad was too light to work the trains, and the Philadelphia and Reading Railroad, which works the Atlantic City fliers—the fastest service in the world —has abandoned compounds for simple superheaters. New Zealand also has followed suit. The compound in the long run has very little to commend itself more than the 4-cylinder simple. It is not popular in Canada, at any rate." Neither were the Webb or the Worsdell–von Borries compound

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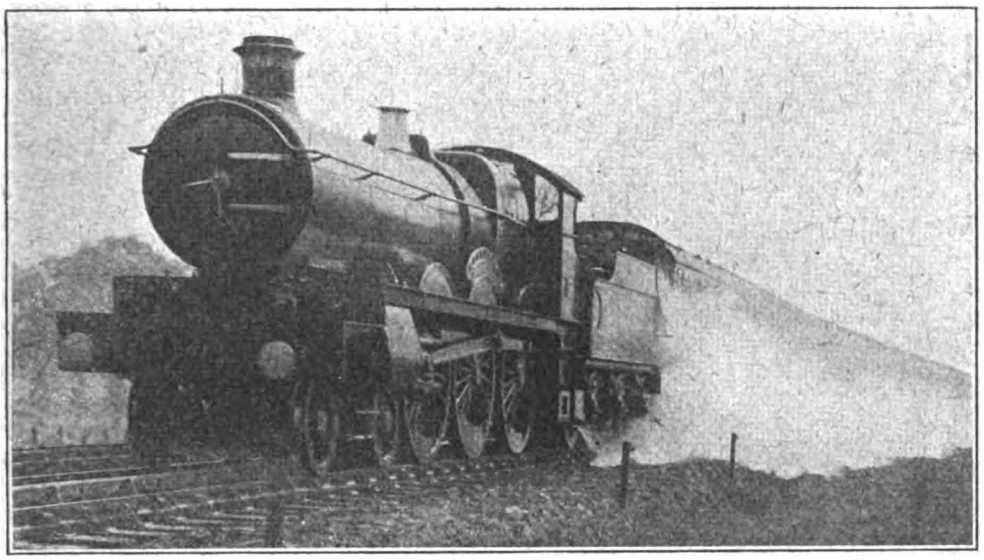
systems popular in Great Britain, but, as I pointed out in the December article, it is of no use judging the merits or demerits of compound propulsion as a whole on the basis of the defects of any particular example. The fact that the above few railways have abandoned the compound principle after experiments so limited in character and insufficient in scope as to furnish practically no comparative data worthy of mention, hardly invalidates compound working as a whole. Against these isolated examples we have the united experience of almost every railway of note on the whole of the Continent of Europe, where compound propulsion becomes more and more firmly



Photo] [*F. E. Mackay.*

GREAT WESTERN RAILWAY.

Birmingham express on Ruislip water-troughs. 2-cylinder 4–6–0 locomotive, No. 2977, *Robertson.*

established. And any unbiassed observer cannot but admit that the steam locomotive has of recent decades received far closer scientific study in such Continental countries as France and Germany—from the standpoint of efficiency in working—then it has in England or America.

"If the Great Western Railway converted their 'Princesses' to compounds," the Canadian writer continues, "they would have to fit 25 in. or 26 in. low pressure cylinders to avoid back pressure, and would experience difficulty in complying with loading restrictions, as it is obvious that such cylinders could not be placed between the frames on a standard gauge engine. The French lines have a much more liberal loading gauge than the English lines. The necessity for clearing platform edges, etc., also curbs any tendency to enlarge cylinders beyond certain limits. You have overlooked this up to now." I am not aware of having done so. The writer apparently assumes that an engine, when converted to compound, would retain the same high-pressure cylinder capacity as at present, with the addition of proportionately larger low-pressure cylinders, which is, of course, an absurd assumption. The exceedingly successful Midland 3-cylinder 4–4–0 compounds have one H.P. cylinder between the frames 19 in. diameter by 26 in. stroke, and two outside L.P. cylinders 21 in. by 26 in. The 999 class simple 4–4–0 engines of the same railway, as superheated, have two cylinders 20 in. diameter by 26 in. stroke, supplied with steam from a boiler of the same dimensions. Now take the proportion between the two H.P. 20 in. cylinders of the 999's and the one H.P. 19 in. cylinder of the compounds, apply it to a Great Western "Princess," and you reduce the four 15 in. cylinders in the latter to two of 14¼ in. diameter. Employ the same ratio between H.P. and L.P. cylinder volumes as in the Midland engines—1 : 2·44—and your L.P. cylinders on the Great Western Railway 4–6–0 would work out at 22 in. diameter by 26 in. stroke. This is, of course, a perfectly

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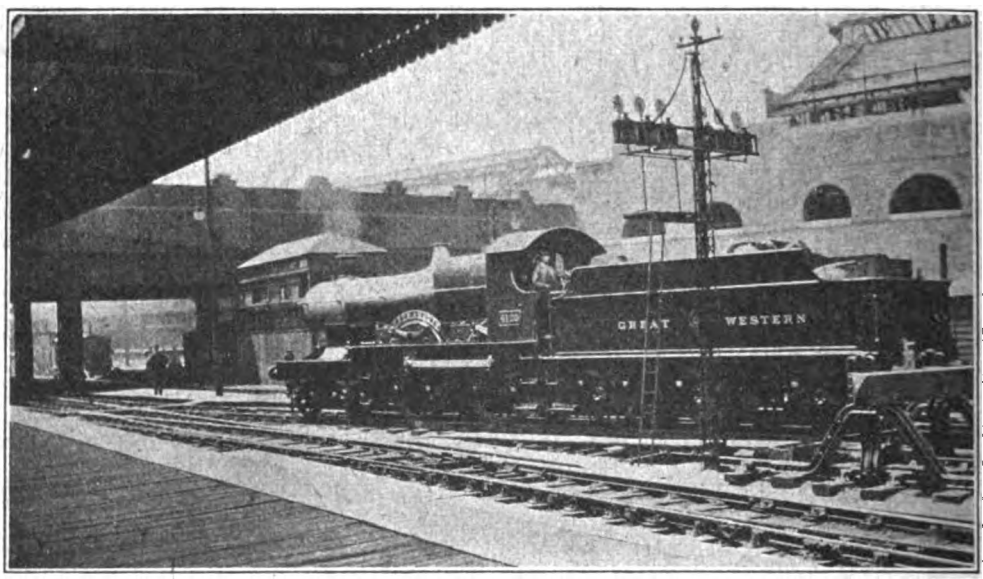
feasible dimension, the 4–6–4 tanks of the London, Brighton and South Coast Railway and the new London and South Western 4–6–0 engines both having 22 in. cylinders outside the frames. So there is clearly no objection at all on these grounds to compound propulsion in this country, at least so far as the present development of locomotive power has proceeded.

Another point raised by two of the writers concerned the high boiler pressure necessary to efficient compound working. My American friend asks in this connection: "Have any comparative tests between simple and compound locomotives ever been conducted on impartial lines? In the Paris, Lyons and Mediterranean tests, for instance, the simple had 14 kg. pressure per cm., while the compound had 16 kg., which was an advantage for the latter. In the Great Western Railway trials the pressures were equal, but the engines were dissimilar in other respects." The difference between the working pressures of the simple and compound locomotives concerned in the Paris, Lyons and Mediterranean trials might explain the superiority of the performance of the latter, but it could hardly explain the economy in fuel and water realised at the same time. In the same connection my English correspondent remarks: "The success of the compound system abroad must be largely due to the simultaneous use of high boiler pressures, and this must surely adversely affect some of the economy sought by means of double expansion." Unquestionably, but the crux of the whole question is as to whether the higher maintenance cost of the compound, with its enhanced working pressure, outweighs its reduced fuel and water consumption and its increased hauling power. The experience of the principal European lines, where compounding has survived the most prolonged and exhaustive of trials, and is now firmly established, would appear to prove the contrary. In Great Britain only one really efficient compound system has ever been given an exhaustive trial, and that is the Smith system on the Midland, which has been an unqualified success for some 15 years past, and is still, of course, in operation.



Photo] [*E. A. Gurney-Smith.*

GREAT WESTERN RAILWAY.

"Flower" class 4–4–0 locomotive, *Stephanotis*, at Victoria station, London.

I am afraid that the facts of the case are too patent for compounding as a principle to be dismissed in any such summary fashion as this. The correspondent last-mentioned draws attention to a remark I made in the same connection in these columns some years ago, to the effect that the advent of superheating had tended to divert the attention of enthusiasts into channels away from compounding, its merits and demerits, with the result that the burning question

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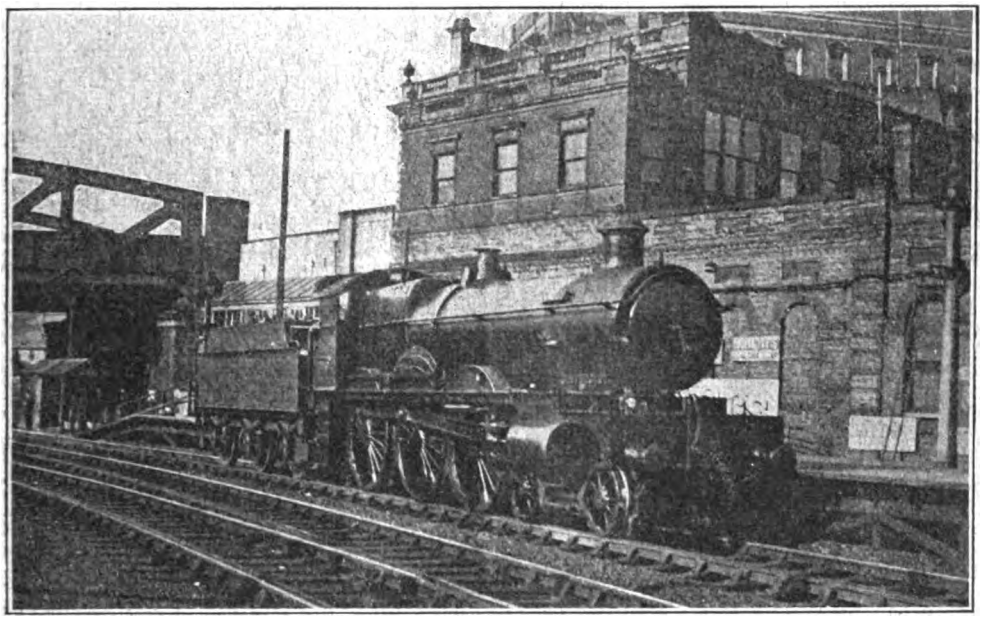
was shelved once again, and that not long after a promise of revival of compound activity in the appearance of successful compounds on the Midland, Great Central and North Eastern Railways. I still believe this to be true. Superheating is so often looked upon as a preferable *alternative* to compounding, whereas it should be regarded, as it now is in Continental countries, as an *ally* of compounding, the maximum ultimate economy being realised when the two are employed in conjunction with each other. My correspondent, in quoting with approval my modest *dictum* in the December issue as to the conservatism of British designers alone standing in the way of the adoption of compounding over here, makes a remark which will serve aptly to conclude the present discussion. "Surely all the pros and cons of the argument are included in this fact, and future investigation becomes therefore a subject for psychic research as to the causes which have led to such remarkable tenacity in the minds of engineers towards the simple method of propulsion!" There for the present I must leave the subject.



Photo] [*E. H. Mansbridge.*

GREAT WESTERN RAILWAY.

2-cylinder 4–6–0 locomotive, No. 2900, *William Dean*, at Paddington.

And now for the long-promised runs on the Glasgow and South Western Railway. In looking over back numbers of the RAILWAY MAGAZINE, I find I have only described two runs over the Glasgow and South Western main line, in each case behind the superheater 4–6–0 No. 129, which carries the Weir feed-water heating apparatus along the top of the boiler. Both these were exceedingly fine performances, and very much above the level of average Glasgow and South Western work, which, one is bound to confess, is not always of the most satisfactory order. At the same time, every allowance must be made for the character of the road, which is a very trying one—more difficult, indeed, in my opinion, than the neighbouring Caledonian route, although the latter aspires to a greater maximum altitude. The first 22 miles out of Carlisle produce no grade of note; then follow the 3 miles at 1 in 200 of Ruthwell bank, followed by ¼ down at the same grade and over 2¼ at 1 in 150 to Racks. From Dumfries there is a level or moderately rising tendency for 4¾ miles, but then we have 4¾ miles up at 1 in 200, a level mile followed by another 1¼ at 1 in 200, with 6 subsequent miles continuously up at about 1 in 150, to just beyond Carronbridge. After this there follow an undulating length of 4½ miles, principally falling, 3 miles up at 1 in 180 and 1 at 1 in 215 to Sanquhar, 2½ level miles, 3½ more ascending, principally at 1 in

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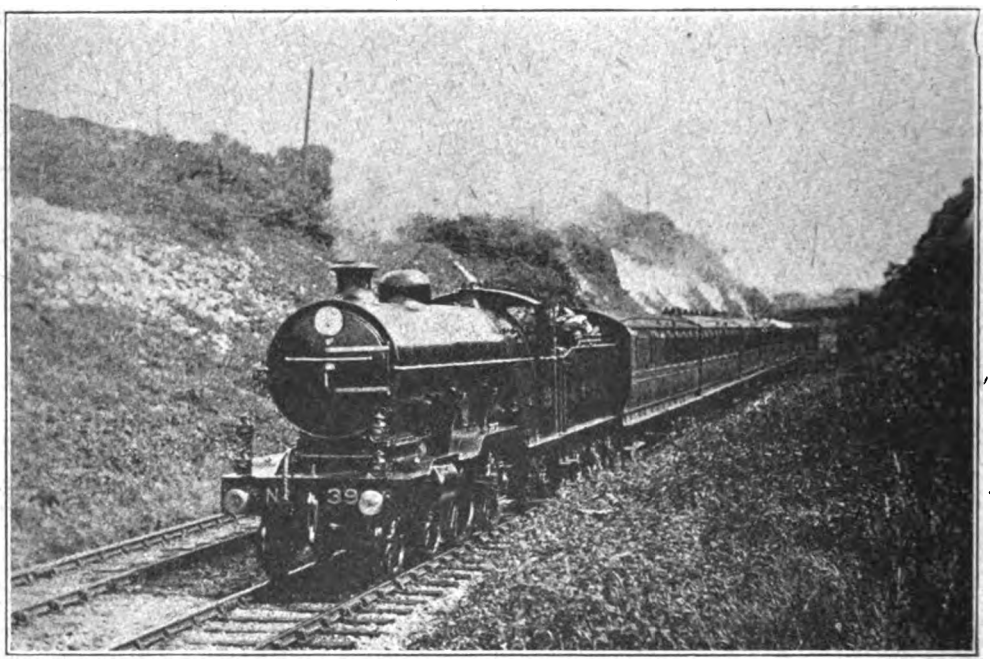
200, and finally a run over a comparatively level table-land to New Cumnock, the summit point, 616 ft. above sea level. At 1¼ miles further on the descent begins, varying mostly for 8½ miles between 1 in 145 and 1 in 180; thence follow a fairly level 3 miles past Mauchline to Mossgiel Tunnel, and finally a drop of 5 miles—4 continuously at 1 in 100—into Hurlford, just before Kilmarnock. On leaving Kilmarnock the worst section of line of all is encountered, rising at 1 in 180 for 2 miles to Kilmaurs, then at 1 in 87 for 1½ miles, 1 in 152 for a mile, and 1 in 75 for 1¾ miles past Stewarton.



Photo] [*T. B. Welch.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Brighton to London Bridge train, 4–4–2 locomotive, No. 39, *La France*.

Another level table-land of over 6 miles, and then a last terrific 5 miles' descent past Neilston and Barrhead, of which 3½ continuously are at 1 in 67–70, after which the remaining 6½ miles into Glasgow are fairly level. Altogether the line throughout is one of considerable difficulty.

My records have been obtained on practically all the important day trains, and I will commence with two on the 5.55 p.m. *ex*-Carlisle, timed shortly before the withdrawal of the 11.30 a.m. from St. Pancras at the beginning of last year. On both occasions there was a very high south-west wind, which caught us badly on all the exposed lengths of the journey. No. 124, 4–6–0, on the first run took eight 8-wheelers, including dining cars, and one 6-wheeler, out of Carlisle, totalling 224 tons empty, and 235 tons with passengers and luggage. A bad start was made, adverse signals stopping us dead at Rockcliffe, and very nearly so at Floriston, so that the first 8·7 miles to Gretna took 18 min., instead of the 11 min. allowed. To Annan, 17·6 miles, we took 29¼ min., to Ruthwell, 24·6 miles, 36 min. 55 sec. (minimum speed 45½ m.p.h. on the 1 in 100 ascent), and to Dumfries, 33·1 miles, 47¼ min., or about 40 min. net. Restarting from Dumfries we passed Holywood, 3·4 miles, in 6 min. 10 sec., fell to 40½ m.p.h. on the 1 in 200 past Auldgirth, and, with an intervening maximum of 45 at Closeburn, maintained 38½ on the 1 in 150 up to Carronbridge. So Thornhill, 14·2 miles, was passed in 21 min., and Carronbridge, 17·5 miles, in 26 min. We touched 60 m.p.h. on the subsequent descent, and went up the 1 in 180 to Sanquhar with a lowest rate of 46 m.p.h., passing Sanquhar, 26·1 miles, in 36 min. 10 sec., and New Cumnock, 36·9 miles, in 49 min. 35 sec., instead of the 45 min.

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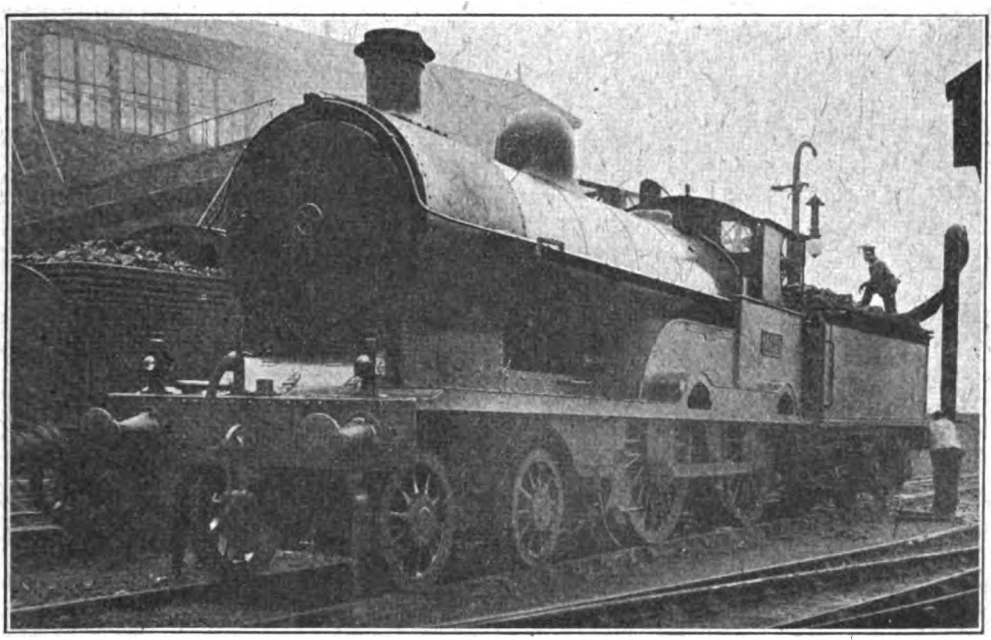
allowed. From there we went very gently down to Kilmarnock, not exceeding 65 m.p.h. before Mauchline, and 70 beyond Mossgiel, so that the 11·7 miles from New Cumnock to Mauchline took 11 min. 55 sec., the 6·7 miles thence to Hurlford 7 min. 35 sec., with many slacks, and the complete 58 miles from Dumfries to Kilmarnock 71 min. 55 sec.—a loss of nearly 3 min. Out of Kilmarnock we mounted to Dunlop, 7·7 miles, in 15 min. 5 sec., ran the table-land of 7 miles to Neilston in 8½ min., and down the 7·8 miles thence into Strathbungo in 8 min. 50 sec.—total 32 min. 25 sec. from Kilmarnock, 22·5 miles. After a stop of



Photo] [*J. W. Idle.*

LONDON AND NORTH WESTERN RAILWAY.

4–4–0 superheater locomotive, No. 1360, *Fire Queen* ("George the Fifth" class).

¾-min., a further run of 5 min. 50 sec. brought us into St. Enoch, 1·9 miles, the aggregate time from Kilmarnock being 38¼ min., against a booking of 35 min. But the pre-war schedules of these trains never allowed for the Strathbungo stop, although it was invariably made.

On the second occasion we left Carlisle with a somewhat lighter load—six 8-wheelers, and two 12-wheeled "diners," 210 tons tare and 220 tons full—but the wind, which was really violent, proved too much for No. 119, 4–6–0, and we took 14 min. to Gretna, 26 min. 10 sec. to Annan, and 48 min. 55 sec. to Dumfries. At Dumfries we detached this lethargic machine, and attached instead No. 128, superheater 4–6–0, but the work did not greatly improve. Speed rose to 47½ m.p.h. beyond Holywood, which was passed in 6 min. 35 sec., fell to 39 on Auldgirth bank, and then settled down to a steady 36 on the ascent to Carronbridge after rising to 44½ at Closeburn. The mile-a-minute rate was again reached at Enterkinfoot, with an ensuing minimum of 44½ m.p.h. at Sanquhar. So Thornhill was passed in 22 min. 20 sec., Carronbridge in 27 min. 55 sec., Sanquhar in 38 min. 20 sec., and New Cumnock in 51 min. 40 sec. After that there was some fast downhill running, with maxima of 69 m.p.h. at Mauchline and 75 beyond Mossgiel, so that Cumnock to Mauchline took 11½ min., Mauchline to Hurlford 7 min., and Dumfries to Kilmarnock a total of 72 min. 50 sec.—a total loss of nearly 4 min. The climb out of Kilmarnock was poor, occupying as it did 17 min. 25 sec. to Dunlop, while Dunlop to Neilston took 8 min. 50 sec. But there was again some fast running on the falling grades, with a maximum of 77½ m.p.h. So the 6·3 miles from Neilston to Pollokshaws took 5½ min., Strathbungo was reached in 33 min. 50 sec., and St. Enoch in 39 min.

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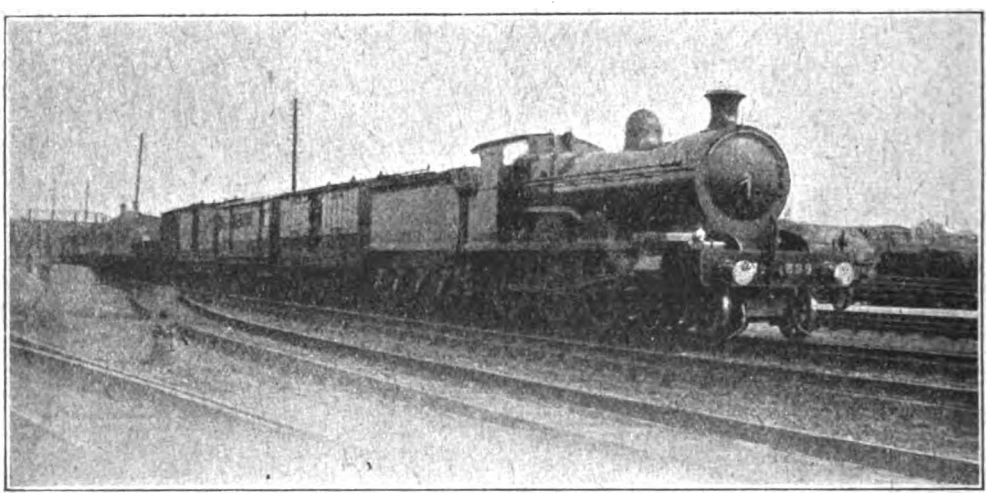
25 sec. Engine losses on this journey totalled nearly 15 min.

Against so depressing a record the work of No. 129, on the now long-cancelled 7.58 p.m. express *ex*-Carlisle, stands out in startling contrast. True, the load was light, consisting as it did of only 3 "eights" and 2 "twelves," or not more than 160 tons all told, but the times were astonishing. Speed rose to 64 m.p.h. before Gretna Junction, where the rate was eased, and again to 66 before Annan; on Ruthwell bank the minimum was 60 m.p.h., and the maximum at Racks 72½. So Gretna was passed in 11 min. 10 sec., Annan in 20¼ min., Ruthwell in 27 min., Racks, 29·2 miles, in 31 min. 20 sec., and Dumfries, where the conditional stop was called, was reached in 35 min. 40 sec. for the 33·1 miles. Unfortunately, I was not at that time familiar with the Glasgow and South Western line, and so secured no minimum speeds on the ascent to New Cumnock. But Holywood was passed in 5½ min., Thornhill in 17 min. 25 sec., Carronbridge in 21 min. (that is to say, speed actually *averaged* 54·5 m.p.h. up the unbroken 1 in 200–150 ascent between Holywood and Carronbridge, 14·1 miles), Sanquhar in 30¼ min., and New Cumnock in 41 min. 5 sec., 36·9 miles.

On the descent to Mauchline a speed of 74 m.p.h. was touched, and again 75 before Hurlford, but generally speaking the rate was moderate, and we took 11¾ min. from New Cumnock to Mauchline, 6 min. 50 sec. thence to Hurlford, and 62 min. 35 sec. in all from Dumfries to Kilmarnock, 58 miles. From Carlisle, 91·1 miles, we had taken a total of 99 min. 25 sec., including Dumfries stop—the schedule allowance was 108 min. —98¼ min. actual running time, and 97 or 96 min. net! Out of Kilmarnock the work was equally good; we breasted the 1 in 75 at a sustained 39½ m.p.h., passed Dunlop in 12 min., Neilston, 14·7 miles, in 19 min. 25 sec., Pollokshaws, 21 miles, in 25 min. 50 sec., and reached Strathbungo in 28 min. exactly. All but 5 min. later we were in Glasgow, but without the Strathbungo stop we could easily have run in from Kilmarnock in 31 min. or less. On the remarkable "form" of this journey, No. 129 could have worked this train from Carlisle to Glasgow, without intermediate stoppage, in 125 min., equalling the then best Caledonian time with a harder road and 15 miles further to go. As it was, she economised on running times to the extent of 8½ min., inclusive of making the conditional Dumfries stop.



Photo] [*David Murray.*

GLASGOW AND SOUTH WESTERN RAILWAY.

Down train passing Annan. 4–6–0 locomotive, No. 389.

In comparison with such work war schedules provide tame reading. Prior to the latest decelerations I made two runs last year on the 4.25 p.m. *ex*-Carlisle. On the first we had No. 124, 4–6–0, with a load of seven 8-wheelers, and two 12-wheeled diners, 256 tons empty and 275 tons full. We did not make the conditional stop at Annan, but got signals "on" there badly;

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nevertheless we passed Annan in 23 min. 55 sec., and reached Dumfries in 44 min. 20 sec. —40 sec. under schedule. Restarting, we passed Holywood in 6½ min., at 45 m.p.h., Thornhill in 23 min. 10 sec., fell gradually to 31½ m.p.h. beyond Carronbridge, which was passed in 29 min. 25 sec.; touched 55½ at Enterkinfoot before falling to 39 m.p.h. at Sanquhar, passed in 40¾ min. from Dumfries. New Cumnock was breasted in 54¾ m.p.h., but a permanent way check spoiled the descent to Mauchline, and the speed after that point did not exceed 68 m.p.h.; so Cumnock to Mauchline took 12 min. 55 sec., and Mauchline into Kilmarnock 10¼ min.—total 77 min. 55 sec., or 76 min. net, from Dumfries. From Kilmarnock we passed Dunlop in 17 min. 25 sec., Neilston in 25¾ min., and reached Strathbungo in 34¼ min., and St. Enoch in 40 min., all but 5 sec., arriving on the stroke of 7.20 p.m. as booked.

Such was not the case on my second journey, however. No. 385 of the same type, on a windy night, was altogether overawed by a load of eight 8-wheelers, and two 12-wheeled "diners" from Carlisle, totalling about 320 tons, as the train was simply packed. To Annan, where the conditional stop was made, we took 26¾ min., and from Annan to Dumfries 24¾ min., in each case start-to-stop, or a total of 52 min. 40 sec., inclusive of 70 sec. standing at Annan. At Dumfries the load was increased by an 8-wheeler to 48 axles, or 345 tons, and we took a 4–4–0 pilot to New Cumnock, the 36·9 miles' uphill journey occupying 53 min. 20 sec. Thornhill was passed in 23¼ min., and Sanquhar in 40 min. 10 sec., the minimum speed at the last-mentioned point being 47½ m.p.h., at Carronbridge 29½ m.p.h., and the maximum at Enterkinfoot 58½ m.p.h. After stopping 95 sec. at Cumnock we covered the 21·1 miles down to Kilmarnock in 26 min. 10 sec.—a very poor piece of work—having taken in all 81 min. 5 sec. from Dumfries instead of the 75 min. allowed. The last section was essayed unassisted, with funereal results, as the speed fell to 13½ m.p.h. beyond Stewarton, and we took no less than 21¼ min. to Dunlop, and 39¾ min. to Strathbungo. Gross time from Kilmarnock to St. Enoch was 46 min., so that we dropped 7¾ min. from Carlisle to Dumfries, 6 min. thence to Kilmarnock, and a further 6 min. on to Glasgow, total all but 20 min. with no immoderate load. Even on the further revised schedule now in force the loss would have aggregated nearly 9 min., the running being inexplicably poor.

The south-bound runs were, on the whole, distinguished by decidedly better time-keeping. They consist of three on the late 9.20 a.m. *ex*-St. Enoch, one of which was on the decelerated 175-min. schedule to Carlisle, leaving at 9.15 a.m. (the starting time is now 9.5 a.m., and the allowance 3 hrs. 10 min.), two on the cancelled 11.0 a.m. from St. Enoch, and one on the 5.30 p.m., which now starts a solid hour earlier. On the first of the runs with the morning express the train engine was a 4–6–0, as usual, and we were piloted right through to Dumfries by one of the rebuilt 4–4–0 engines; I omitted to secure the number of either of the locomotives concerned. The load was one of 43 axles, or 275 tons. Strathbungo, 1·9 miles, was passed in 4 min. 20 sec.; Nitshill (at the foot of Neilston bank), 5·9 miles, in 9 min. 5 sec.; Caldwell, 12·8 miles, in 19 min. 10 sec.; Dunlop, 16·7 miles, in 23½ min.; and Kilmarnock, 24·4 miles, was reached in the smart time—in view of the tremendous intermediate grades—of 31¼ min., 3¾ min. early. The highest speed beyond Stewarton was one of 83 m.p.h. On restarting we climbed to Mauchline, 9.4 miles, in 15 min., and to New Cumnock, 21·1 miles, in 28 min. 55 sec.—again an excellent achievement, even though the load were light for two engines —covered the 10·8 level and falling miles to Sanquhar in 10½ min., the 8·6 undulating miles on to Carronbridge in 8 min. 10 sec.; the 3·3 miles from Carronbridge to Thornhill in 3 min. 5 sec.; and the 10·8 miles thence to Holywood in 8 min. 55 sec. This gave a total of 30 min. 40 sec. for the 33·5 miles from New Cumnock to Holywood, and at times the speed was very high, the maximum at Enterkinfoot being 72½ m.p.h., and beyond Closeburn 77½ m.p.h., sustained, although a number of checks were made over curved portions of the line. So Dumfries, 58 miles, was reached in 63¾ min. from Kilmarnock, 4¼ min. under schedule time, the two engines having thus gained in all 8 min. from Glasgow. After losing the pilot at Dumfries we covered the 15·5 miles to Annan in 20 min. 5 sec., start-to-stop, as scheduled, but lost 100 sec. on the run thence to Carlisle, 17·6 miles, which took 24 min. 40 sec.

On the second run with this train we had a lighter load of 42 axles, or 265 tons in all, the train engine throughout being 4–6–0 No. 384, piloted to Kilmarnock only by an early Smellie 4–4–0. We passed Strathbungo in 4 min. 10 sec.; Nitshill in 9 min. 10 sec. (at 53 m.p.h.); Caldwell in 20 min. 50 sec.;

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Dunlop in 25¼ min.; and reached Kilmarnock in 34 min. 5 sec., a minute early: The ascent of Neilston bank was mild in character, speed falling to 24 m.p.h., and the maximum at Kilmaurs was only 69. Re-starting from Kilmarnock without the pilot, our average rate up the 1 in 100 to Mossgiel Tunnel was only 27 m.p.h., and on the subsequent ascent to Cumnock we fell to 34 m.p.h., so that it took us 18¾ min. to pass Mauchline, and 36 min. 5 sec. to New Cumnock. After that we ran on to Sanquhar in 11¼ min., from Sanquhar to Carronbridge in 8½ min., Carronbridge to Thornhill in 3 min., Thornhill to Holywood in 9 min. 10 sec., and stopped at Dumfries in 72 min. 5 sec. from Kilmarnock, having lost 4 min. The 33·5 miles from New Cumnock to Holywood occupied 31 min. 55 sec., with maxima of 71½ m.p.h. at Enterkinfoot and 72½ at Closeburn. As customary on the Glasgow and South Western Railway, at almost every important stop, time was lost at Dumfries by drawing the train up very slowly to the water column. Beyond Dumfries the work was poor, as we took 23 min. 40 sec. on to Annan, and 23 min. thence to Carlisle, a total loss to engine of 2 min.

The last of the three runs on this train was made on last year's "war" schedule, with a very much heavier load of ten 8-wheelers and two 12-wheelers, 338 tons empty, and fully 365 tons loaded, as the train was crowded. 4–6–0 No. 124 was the engine, with a rebuilt Manson 4–4–0 as pilot to New Cumnock. Strathbungo was passed in 4 min. 40 sec.; Nitshill in 10 min. 25 sec.; Caldwell in 23¾ min.; Dunlop in 28 min. 40 sec.; and Kilmarnock was reached in 38 min. 5 sec., as booked. Minimum speed at Neilston was 22 m.p.h., and maximum at Kilmaurs 64 m.p.h. After leaving Kilmarnock we maintained 28 m.p.h. on Hurlford bank, attained 53 on the level stretch past Mauchline, and kept up 42–43 m.p.h. on the subsequent ascent to Cumnock. So Mauchline was passed in 17 min. 10 sec., and New Cumnock, where we stopped to detach the pilot, was reached in 32½ min. We stood for 65 sec. at a point about 0·3 miles north of the station, and then went very moderately down to Dumfries, passing Sanquhar, 11·1 miles, in 13½ min.; Carronbridge, 19·7 miles, in 23 min.; Thornhill, 23 miles, in 26¼ min.; Holywood, 33·8 miles, in 36 min.; and reached Dumfries, 36·9 miles, in 40 min. 20 sec., or in 75 min. 40 sec. from Kilmarnock, 20 sec. inside time. After Dumfries, however, the running went altogether to pieces, our time to Annan being 23 min. 50 sec., and thence to Carlisle no less than 30½ min., where we arrived 7½ min. late.

Next comes a run on the 5.30 p.m. *ex*-St. Enoch—a train that almost invariably reached Carlisle well behind time. No. 383, 4–6–0, ran unpiloted throughout with a load of 38 axles, or 250 tons, from Glasgow. Strathbungo was passed in 4¾ min., Caldwell in 22 min. 40 sec., Dunlop in 27 min. 40 sec., and Kilmarnock was reached in 36 min. 20 sec.—a loss of 3¼ min. Speed fell to 23 m.p.h. on the 1 in 67–70, and rose to 70 m.p.h. at Kilmaurs. On the second stage we maintained 33–34 m.p.h. on the 1 in 100 to Mossgiel, and, after a maximum of 54 beyond Mauchline, of 44–45 m.p.h. on the succeeding ascent to New Cumnock, passing the former station in 15¾ min., and the latter in 30 min. 25 sec.—a very fair piece of work indeed. But we travelled very moderately on to Dumfries, taking 11 min. 20 sec. from Cumnock to Sanquhar, 8 min. 50 sec. thence to Carronbridge, 3 min. on to Thornhill, 10¼ min. from Thornhill down to Holywood (total 33 min. 25 sec. from New Cumnock to Holywood), and so reached Dumfries in 68 min. 25 sec. This showed a gain of 1½ min. on schedule, in virtue of the good start from Kilmarnock. The highest intermediate speed was at Enterkinfoot, and was one of 68 m.p.h. Such an allowance as 43 min. from Dumfries to Carlisle by this train, with an intermediate stop at Annan, was a tight one, and we exceeded it handsomely, although the load was increased at Dumfries to 53 axles, or 335 tons. Dumfries to Annan took 22 min. 50 sec., and Annan to Carlisle 28 min. 10 sec., or 25 min. net, the last-named length including a bad signal slowing at Gretna. The engine dropped in all some 7 min. net, and we arrived 17½ min. late.

Finally I have to describe two runs on the 11.0 a.m. from St. Enoch, which used to call at Kilmarnock and Dumfries, but not at Annan. On the first of these, No. 124, 4–6–0, which has already figured in three of the runs preceding, took a modest load of 31 axles, or 215 tons, and passed Strathbungo in 4 min. 40 sec., Caldwell in 22 min. 40 sec., Dunlop in 27 min. 10 sec., reaching Kilmarnock in 36 min. 20 sec. 80 sec. were thus lost on schedule by poor work, speed falling to 22 m.p.h. at Neilston, and not rising above 67 at Kilmaurs. At Kilmarnock the load was increased to 33 axles, or 225 tons, and the ascent from there was fair, the maintained speed on the 1 in 100 being about 29 m.p.h. Mauchline was passed in 16 min.

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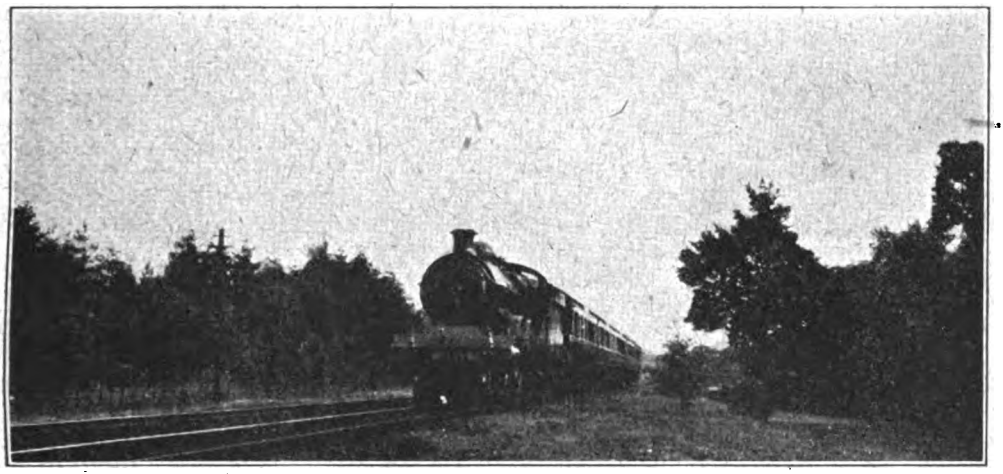
35 sec., and we reached Old Cumnock, 15·8 miles (where a special stop was made) in 25½ min. Re-starting, we passed New Cumnock, 5·3 miles, in 10 min., and then achieved some fast running. New Cumnock to Sanquhar took 10 min. 20 sec., Sanquhar to Carronbridge 8 min., Carronbridge to Thornhill 3 min., and Thornhill to Holywood 9 min. 10 sec., total 33·5 miles in 30½ min., during which we touched 71½ m.p.h. at Enterkinfoot, and maintained 71½ to 74 all the way from Thornhill to beyond Holywood. So Dumfries was reached in 70 min. 25 sec., inclusive of the stop, or not over 66 min. net. Starting again with a further 2 axles, or 235 tons, we passed Ruthwell, 8·5 miles, and taking 27 min. 5 sec. to Dunlop; but beyond Stewarton we touched 85 m.p.h., and so reached Kilmarnock in exactly 35 min., as booked. On the second stage we maintained 28 m.p.h. on the ascent to Mossgiel, and passed Mauchline in 16¼ min., and New Cumnock in 29 min. 50 sec., while from New Cumnock to Holywood we tied with the fast 30½ min. time of the last run. Cumnock to Sanquhar took 10 min., Sanquhar to Carronbridge 7¾ min., with a maximum of 75 m.p.h.; Carronbridge to Thornhill 3 min.; and Thornhill to Holywood 9¾ min., with a maintained speed of 69 m.p.h. So Dumfries was reached in 64 min. 10 sec. from Kilmarnock—an economy



Photo] [*E. A. Gurney-Smith.*

GREAT CENTRAL RAILWAY.

3.15 p.m. Manchester express *ex*-Marylebone near Sandy Lodge. 4–4–2 engine No. 1093.

in 12 min. 20 sec.; Annan, 15·5 miles, in 18 min. 50 sec., at 67 m.p.h.; Gretna Junction, 24·4 miles, in 27 min. 50 sec., and reached Carlisle, despite a slight signal check, in 37 min. 50 sec., or 37½ min. net, a further gain of 2½ min. to engine. On this occasion, therefore, No. 124 gained 2½ plus 2 min. on schedule, less 1¼ min., *i.e.*, 3¼ min. net.

The times of this run were, however, substantially beaten by those of No. 129, the superheater 4–6–0, with a load of 29 axles, or 200 tons, out of Glasgow. Strathbungo was passed in 4 min. 25 sec., and Nitshill in 9 min. 55 sec.; up Neilston bank we went rather poorly, falling to 14 m.p.h., of nearly 4 min. on the 68-min. schedule for this 58 miles' stretch. As we were now well on time, the last section into Carlisle was taken in a more leisurely fashion, the load, by the way, being increased to 220 tons. We passed Ruthwell in 12 min. 20 sec.; Annan in 19 min.; Gretna Junction (where a careful slack was made) in 28 min. 40 sec.; and reached Carlisle in 39 min. exactly, having thus gained a further minute on schedule. The total gain on the journey was therefore 5 min., and the south-bound run is a fitting complement to the magnificent effort of No. 129 in the opposite direction. One might wish that the running recorded in general had been more of the same order.

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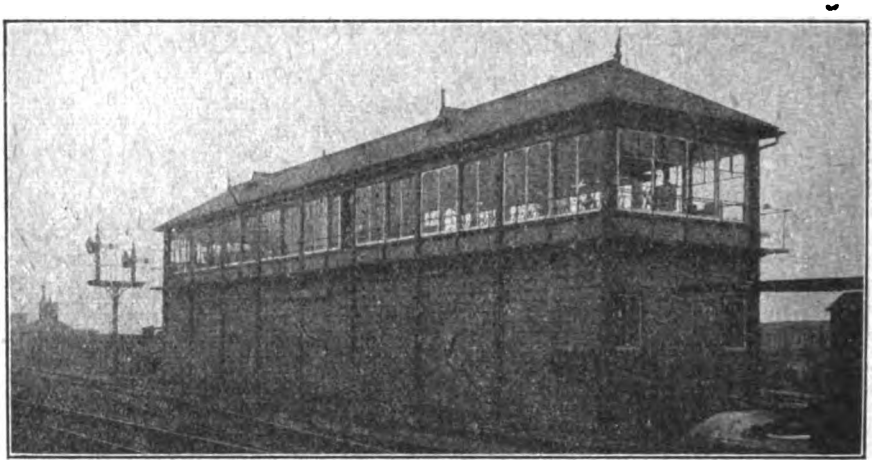
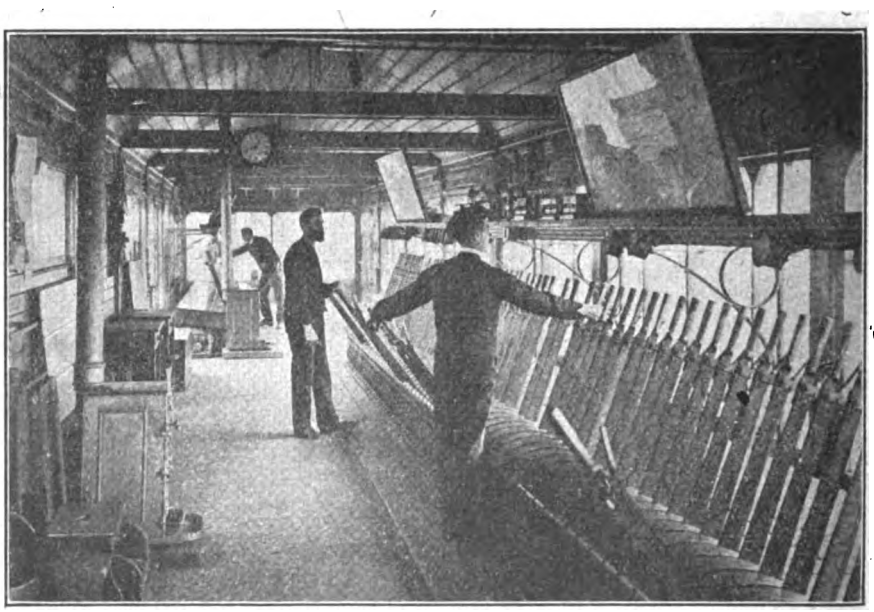
The Largest Signal Box on the Midland Railway.



ST. PANCRAS PASSENGER JUNCTION SIGNAL BOX, EXTERIOR.

BY the courtesy of the Acting-General Superintendent of the Midland Railway the RAILWAY MAGAZINE is able to illustrate the largest signal box on the Midland line, viz., that at St. Pancras (London) Passenger Junction.

This box contains 112 levers, of which 36 are at the present time spare.



ST. PANCRAS PASSENGER JUNCTION SIGNAL BOX, INTERIOR.

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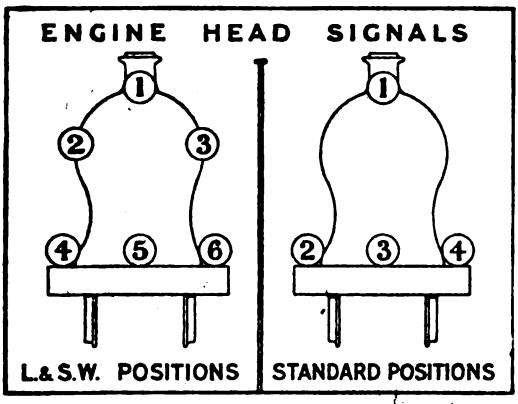
New Engine Head Signals on the London and South Western Railway.

WHITE DISCS BY DAY: WHITE LIGHTS BY NIGHT.

FOR many years it has been the practice on the London and South Western line for certain of the engine head signals to be formed of a combination of white and green lights by night and white discs and diamond-shaped boards by day, but it has now been found possible to eliminate the diamond-shaped white boards and green lights from the head signals, they thus sharing the fate of the black crosses which a few years ago figured conspicuously in London and South Western head signals.

Engine head signals constitute a very important aid to railway working, particularly in the case of the London and South Western Railway with its many junctions and alternative routes, and the objects aimed at by the recent revision are increased safety, clearness, and simplicity.



The use of green lights for head signals has objections, the chief being the possibility of their being mistaken for "All Clear" signals; then experience proves that white diamonds when viewed from a distance are somewhat difficult to distinguish from white discs. The revision, therefore, corrects those two objections, and opportunity has at the same time been taken to reduce the 40 head signals previously in use to 25, no less than 21 signals, in which one or more white diamonds or green lights figured, having been deleted, while six new head signals have been introduced. The 25 existing head signals for ordinary working provide for the requirements of no less than 120 different services, most of them being utilised for several services without, however, any possibility of misunderstanding arising, as the various services which carry the same signal are well apart. For instance, a disc in position 1 on diagram serves to indicate a dozen services such as Guildford to Farnham; Exeter to Torrington; Petersfield to Midhurst; Botley to Bishop's Waltham; while discs in positions 2 and 3 form the signal for traffic between Clapham Junction and Kensington, Ascot and Farnham, Eastleigh and Portsmouth, without any confusion, in consequence of the geographical separation of the various services concerned. The confining of the head signals to the principle of white discs and white lights, as has been done by the revision, brings the London and South Western Railway in this respect into line with several other companies which use what is known as the standard head signals. Only four positions on the engine are required for the standard head signals, as against six for the various South Western codes.

The standard head signals consist of nine combinations of white discs or white lights, and are used to indicate the nature of the train instead of the sections and routes as in the case of the London and South Western head signals. Thus discs or lamps at positions 2 and 4 indicate express passenger trains. Slow passenger trains are indicated by a disc or lamp at position 1. Trains formed of coaching stock with fish, fruit, horse, cattle, or perishable traffic carry a disc or lamp at positions 1 and 2, while a fish, meat, and fruit train, formed of goods stock, carries discs or lamps at positions 1 and 4. The standard head signals are used by the Great Western Railway and as London and South Western trains run over certain portions of the Great Western line beyond Exeter, and between Dorchester and Weymouth, and Chard and Chard Town, London and South Western engines

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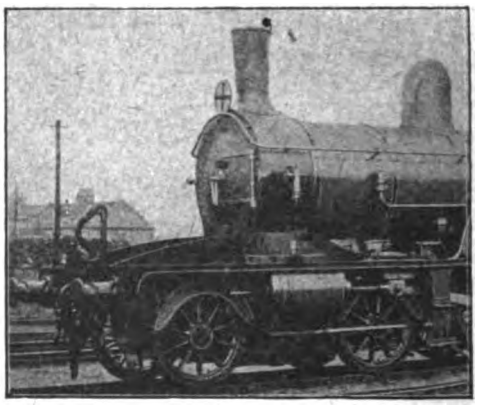
travelling over these sections carry the Great Western head signal, substituting discs for the Great Western practice of unlighted lamps by day.

"DIAMONDS" DISAPPEAR.

In addition to the head signals already indicated, there is, of course, the "special train" head signal, viz., a white disc with black centre by day and a purple light by night used by the London and South Western, while for the electric trains the Letter head signal remains unaltered. On the Company's tube line between Waterloo and the City, the head signal consists of two red lights.



AN OLD "CROSS" DISC SIGNAL.

Practically unnoticed by passengers, other than RAILWAY MAGAZINE readers, engine head codes are to the railwayman of peculiar interest and importance, and of the greatest assistance in the regulation of the traffic.

Please send this magazine post free to the troops. It may be handed over the counter at any post office in the United Kingdom without wrapping or address. No postage need be paid. Do it to-day.

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The Stann Creek Railway.

By R. W. A. SALTER.

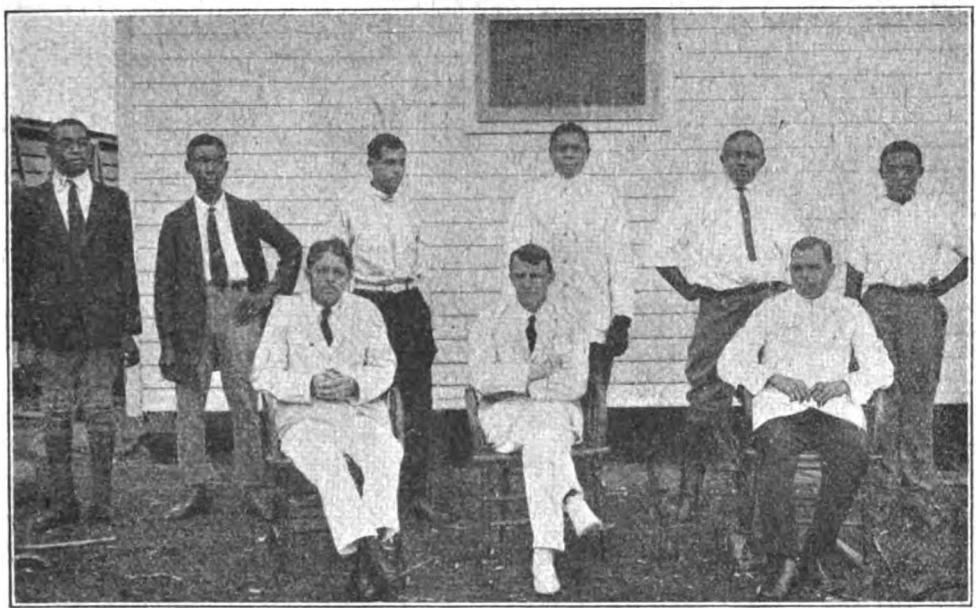
BUILT during the years 1907–9 to open up the valley of Stann Creek river, of which the greater part is specially adapted to banana cultivation, the Stann Creek Railway is the only line in British Honduras.

In England little is known of British Honduras; indeed, such a small outpost of our empire is apt to be overlooked. The colony occupies a small portion of the Atlantic slope of Central America and has for its near neighbours the republican states of Mexico and Guatemala. It is about one-third the size of England, and divided into six districts—Belize, Corozal, Orange Walk, Stann Creek, Toledo and Cayo.

The railway starts at Commerce Bight Pier and runs a distance of 25 miles into the interior, keeping, however, within the boundaries of Stann Creek district. Commerce Bight Pier, a structure 1,208 ft. long, gives 20 ft. of water at all seasons. It is built on 67 timber trestles of 15 ft. span joining to a recently completed concrete head 203 ft. long and 25 ft. wide, on which are laid two tracks connecting with a single track laid on the timber structure. Vessels dock at this concrete portion, the construction of which involved 12 pairs of reinforced concrete cylinders sunk into the sea-bed and connected by massive reinforced concrete beams. Spring fenders are provided.

The gauge of the railway is 3 ft., and flanged rails, 40 lbs. per yard, spiked to creosoted sleepers, are used. On leaving the pier the lines enter a goods yard equipped with three sidings, and two miles further, in a northerly direction, is the railway station of Stann Creek, which consists of the main offices, quarters for European staff and native employees, a machine shop, running shed, car shed and carpenter shop.

Front of the station lies the Caribbean Sea; behind stretch dense forest and swamp



STANN CREEK RAILWAY.
Some of the Staff.
Mr. W. E. Allison, Superintendent, is seated in the centre of the front row.

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land. A mile away is situated the town of Stann Creek, inhabited by about 2,000 people.

Two years after the railway was opened several parts of it were damaged by great floods, two bridges crossing the Stann Creek river being washed away and other works destroyed. There are in all 30 bridges, of varying spans, each consisting of steel girders and concrete abutments and piers. Bridges at 16¼, 18¼, 19⅛ and 20 miles are carried by reinforced concrete trestles laid with steel girders. The trestles differ in height from 16 ft. to 32 ft. above ground and are designed to take girders from 20 to 30 ft. long.

The bridge at 19½ miles has nine trestles, and spans 20, 22 and 30 ft., giving a total length of 408 ft. between abutments. The bridge at 18¼ miles is about 230 ft. long and carried on five concrete trestles. At 16¼ miles the bridge is 180 ft. long and carried on three trestles.

In addition to this type there are four lattice girder bridges of 100 and 150 ft. clear span, resting on concrete abutments; and one plate girder type of 50 ft. span.

The whole track is ballasted with white limestone rock broken by a stone-crusher situated at a quarry worked by the railway near the main line.

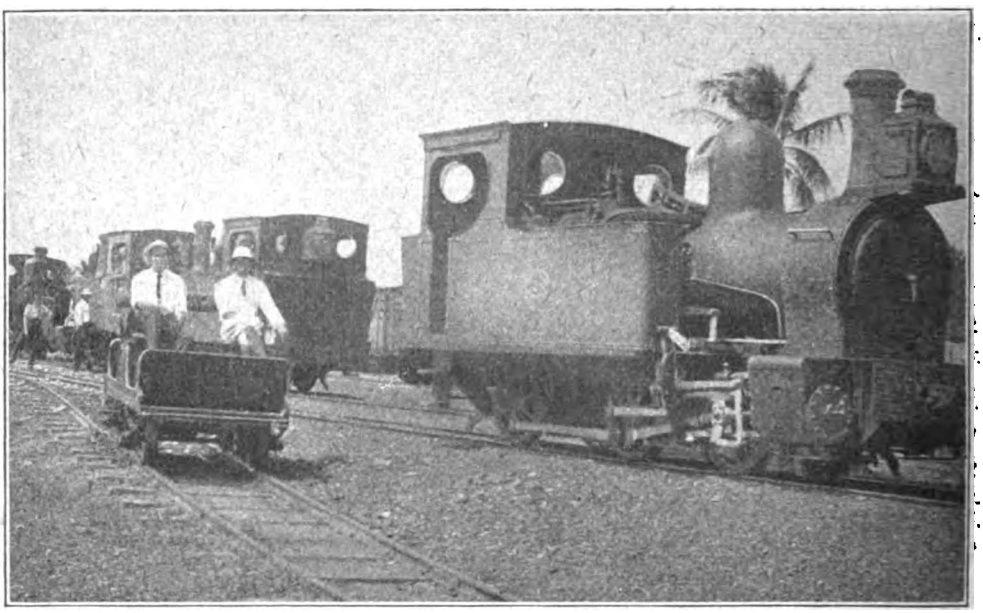
Much of the ground on either side of the railway is under banana cultivation.

The large banana plantations are equipped with light trolleys hauled by mule-power, on 12-lb. rails, which transport fruit to the main line, where it is stored under sheds until the arrival of the train, the fruit generally being cut the day previous to collection. Before loading on to the train, each bunch undergoes examination by an inspector on behalf of the buyer. The fruit is purchased by two American companies, who run steamers of about 600 tons displacement on alternate weeks to New Orleans, La., and Mobile, Ala., respectively.

The rates charged by the railway for transportation of bananas are 5 cents each on large bunches (*i.e.*, those which have not less than eight hands of fruit on them, a hand consisting of 15 to 20 fingers) and 3 cents each on smaller bunches, irrespective of the distance of the steamer. The usual capacity of the trucks is about 300 bunches. Practically the whole revenue of the railway is evolved from this freight.

The total export of bananas from the colony in 1914 was 673,443 bunches. In 1916 the railway carried for export over half a million bunches.

In a land of perpetual sunshine the fruit grows throughout the year. The slackest months are from November to January, the busiest from May to August. Most dreaded by banana growers are wind storms, one of



STANN CREEK RAILWAY LOCOMOTIVES.

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which can flatten miles of plantation in several minutes, more especially should the soil be wet. Several severe storms have occurred in recent years, one in January, 1915, proving itself the most destructive.

Passenger traffic is derived almost entirely from planters and their workpeople. In 1916 over 12,000 passengers and 1,500 tons of general merchandise were carried by the railway for the plantations. Ordinary fares are approximately 1½d. per mile; while Saturday to Monday excursion tickets are issued at a fare and a half.

In addition to the fruit trains, which are generally arranged for Wednesdays and Thursdays, a passenger train is timed to run to Middlesex (railhead) on Mondays and Saturdays, stopping at any station to pick up or let down passengers or to load or unload goods. Trains are run on other days when traffic merits such.

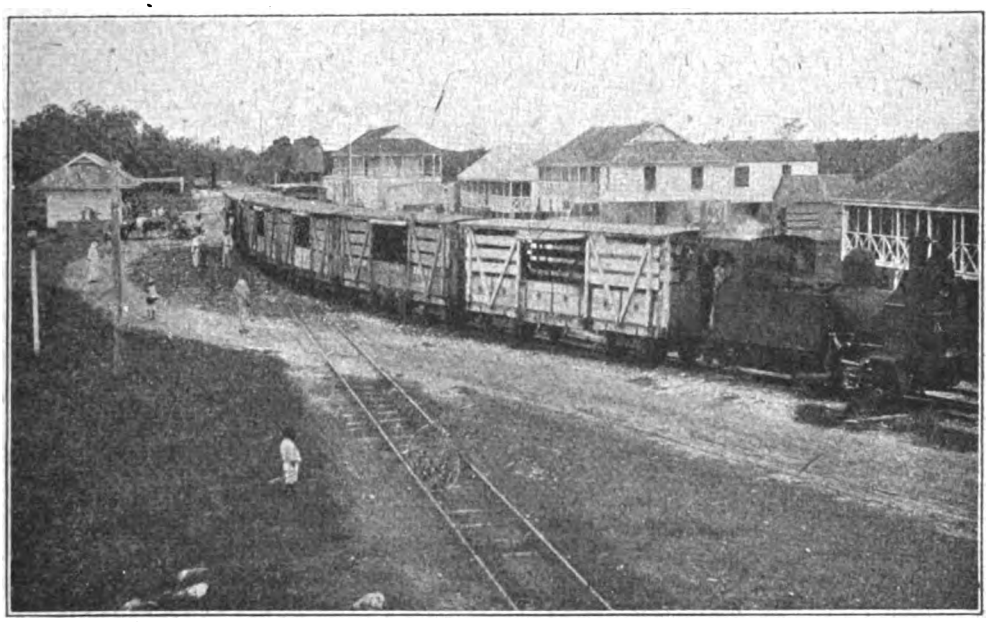
The steamers from New Orleans and Mobile call on alternate weeks with merchandise on their way south to Puerto-Barrios and Livingstone, in Guatemala. On their return voyage they load fruit at various points on the coast, usually reaching Commerce Bight Pier on Thursday evenings. The fruit is immediately run alongside the ship and stowed by hand. A locomotive is kept in attendance for purposes of shunting.

There are six stations, or halts, on the railway, viz.:

Carib Switch (distance from Commerce Bight Pier			4¾	miles)
Hope Creek	,,	,,	9¼	,,
Mullins River Road	,,	,,	12½	,,
Macaroni Hill	,,	,,	15	,,
Welcome Creek	,,	,,	20	,,
Middlesex	,,	,,	24¾	,,

At Mullins River Road the railway works a light tramway, 1⅜ miles in length, which is employed in bringing out bananas from adjacent back lands.

The railway is equipped with sidings at Hope Creek, Macaroni Hill, 18 miles, 19 miles, 22 miles and Middlesex.



STANN CREEK STATION.

There are no severe gradients on the line excepting a short length between the posts at 18¼ and 19 miles, where the grade averages 1 in 60. The elevation at railhead is 300 ft. above sea-level. The country away from the coastal region is hilly, and covered with dense vegetation, which adds much to the difficulties of exploration work.

Almost anything will grow in the climate of British Honduras, and among other things sugar-cane, rice, cacao, corn, cocoanuts, grape-fruit, oranges, limes, rubber and tobacco do especially well. The colony suffers from lack of capital and cheap labour.

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There are four 6-coupled side-tank locomotives, weighing 20 tons each, with cylinders 11½ in. diameter by 16 in. stroke, fitted with Walschaert valve gear, steam brake, and two Gresham and Craven injectors, and burning coal as fuel. The wheels are 2 ft. 6 in. diameter on tread; wheelbase, 10 ft. Heating surface particulars are as follows:

108 brass tubes 1⅝ in. outer diameter	= 325 sq. ft.
Firebox	= 54 sq. ft.
Total	379 sq. ft.

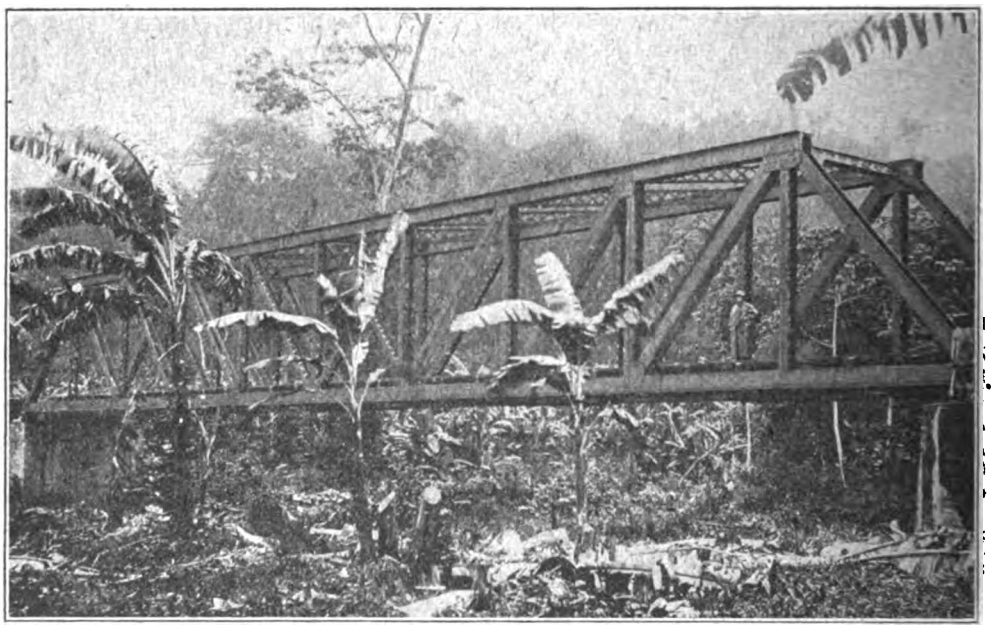
The grate area is 7 sq. ft.; working pressure, 160 lbs. per sq. in.; length of boiler between tube plates, 7 ft. 1 1/16th in.; diameter of boiler, 3 ft. 2½ in.; Belpaire firebox. These locomotives were supplied by the Hunslet Engine Company, Leeds.

There are 63 goods wagons, 2 passenger coaches, 2 brake-vans and 1 rail motor-car. The goods wagons and coaches were supplied by the Gloucester Railway Carriage and Wagon Company, Messrs. Pickering and Company, and by a German firm, who completed their delivery of 15 vehicles just prior to the war. The interior length of these cars is 25 ft. 1 in.; centre of bogies (steel underframes), 16 ft. 8 in.; width inside, 6 ft. 6 in.; chilled cast-iron wheels 2 ft. diameter on tread. Each is provided with a hand brake applying cast-iron brake-blocks on all wheels, which can be operated from either end. A central buffer, supplied by the Automatic Brake Coupler Company, is used. The cars carry 14 tons and tare 4 tons 15 cwt. 3 qrs. A number of ballast trucks were recently converted into fruit trucks by the addition of a roof.

The motor-car is a 6 h.p. vehicle with two speeds, forward and reverse, chain drive, water-cooled engine, and supplied by the Drewry Car Company.

Honduras was discovered by Columbus in 1502, and inhabited by a few shipwrecked British subjects 126 years later. The English took possession of Ruatan island in 1642, although Grijalva landed on Cozumel island in 1518 and named the surrounding land New Spain. In 1662 logwood cutters established themselves at Cape Catouche. Spain, in 1670, ceded the country in perpetuity to Great Britain, since when the population of the colony has slowly increased. For years the climate of British Honduras has been maligned and a reputation formed which has done much to curb its expansion.

The topography of the colony is greatly



23 MILES BRIDGE.
150 ft. span.

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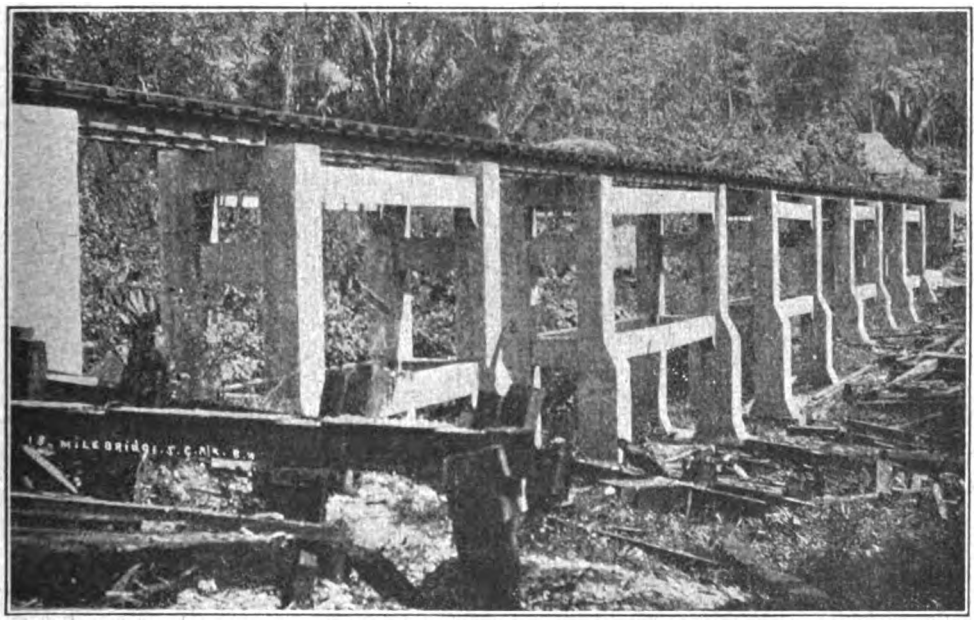
diversified. Away from the flat, swampy coast are hills, covered with virgin forests rich in precious woods—chiefly mahogany. The principal industry is woodcutting. The mineral products are yet undeveloped, as are many of its other resources. Along the whole of the sea-coast, which stretches some 160 miles almost due north and south, and reaching many miles eastward, are innumerable coral islands, or cays, abounding in mangrove trees; whilst some are under partial cultivation. Some of the smaller reefs render navigation difficult and hinder the approach to Belize harbour.

Belize is the principal town and the seat of the governor and legislative council. Corozal, a depôt for wood cut along the river on whose banks it is situated, comes next in importance.

Readers may ask why the railway was not made to connect with the chief town; but this is easily explained in the fact that Belize is well served by its waterways. The railway provides a means of transportation to or from places otherwise almost inaccessible. On the whole the waterways of British Honduras are extensive and largely used, but need further supplementing before the full resources of the colony can be realised. The first idea was to build a railway from Belize westward to the frontier of Guatemala, thence to Guatemala City, which would have opened up immense commercial, agricultural and mineral fields; but this was never accomplished.

From its inception the Stann Creek Railway has been capitalised and worked by the government. The receipts for the years 1914–5 were approximately £5,673, and the expenditure during the same period amounted to £11,565.

The photograph reproduced on page 175 portrays some of the staff of the Stann Creek Railway. Mr. W. E. Allison, Superintendent, is to be seen seated in the centre of the front row. Mr. Allison received his technical training through the Glasgow Technical College and in the services of the Caledonian and Midland Railways. After a term lasting five years on the staff of Carruthers & Elliot, consulting engineers to the New Zealand Government Railways, he was in 1913 appointed Chief Mechanical Engineer of the Stann Creek Railway, and a year later assumed the duties of his present position. Mr. Allison's nature is one of perseverance—so essential in a country like Central America, where the feelings of the people are immoderately tempered by the climate—and resulting on his tactful handling of matters pertaining to the railway, he enjoys the esteem not only of all his employees but of the European residents of the colony.



CONCRETE TRESTLE BRIDGE.
Five trestles. Total length, 230 ft.

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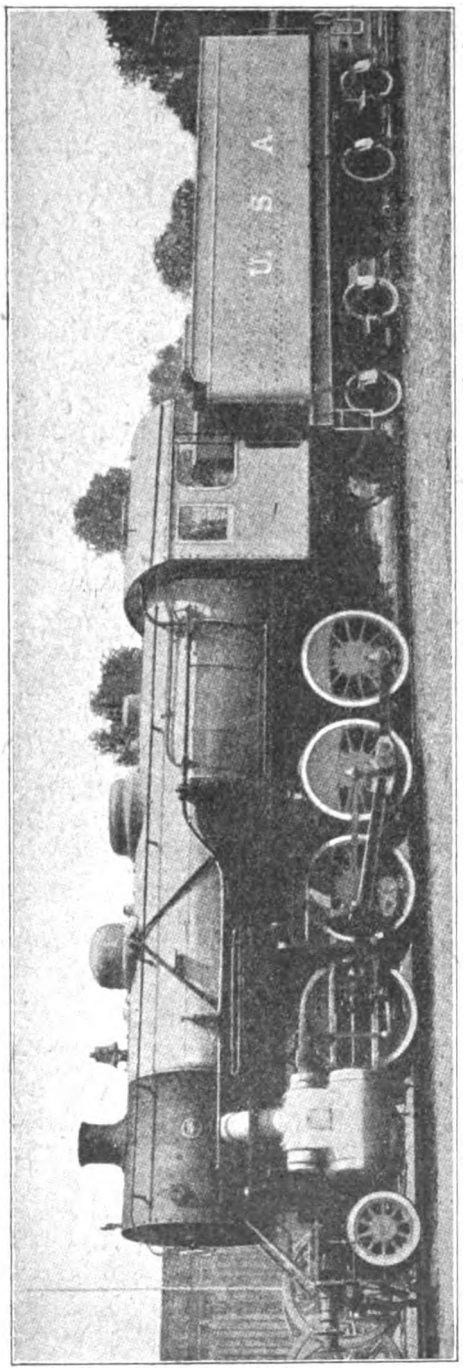
American War Locomotives for France.



IN the January RAILWAY MAGAZINE particulars were given on page 60 of the rapid building in the United States of America of locomotives for service with the American troops in France.

Here is illustrated the first locomotive built by The Baldwin Locomotive Works, for the service mentioned. It is of the 2–8–0 type, with outside cylinders, having piston valves above them, the valves being actuated by Walschaerts' gear. The design is essentially American, but the cab is built on European lines, and the leading dimensions are more in accordance with those adopted on the British side of the Atlantic, the cylinders having a diameter of 21 in. by 28 in. stroke and the engine weighing 72 tons. The coupled wheels have a diameter of 4 ft. 8 in., and the wheelbase of the engine is 23 ft. 8 in. The total heating surface, including the superheater, is 2,282 sq. ft., with grate area 32·7 sq. ft. These dimensions closely approximate to those of the 2–8–0 type locomotives of Mr. Gresley's design on the Great Northern Railway, and the arrangement of the cylinders, valves and valve operating mechanism is the same. The tractive effort of the American locomotive is 35,700 lbs. at 0·85 of the boiler pressure, which latter is 190 lbs. per sq. in. That of the Great Northern locomotive is 31,812 lbs., the difference being accounted for by the fact that the boiler pressure in the latter case is 20 lbs. below that of the Baldwin engine, namely, 170 lbs., as against 190 lbs.

Other particulars are :—

Weight on coupled wheels	67 tons
Boiler, diameter	5 ft 10 in.
,, length of tubes	13 ft. 9 in.
,, number of tubes	165
,, diameter of tubes	2 in.
,, number of superheater flues	26
,, diameter of superheater flues	5⅜ in.

The tender is of the eight-wheeled double-bogie pattern with diamond frames.

Except for the fact that these locomotives are superheated and those built at the Baldwin Locomotive Works of the same general type for the British War Office are not, the two designs are practically identical. The cost per engine is said to be about £8,830.

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An Early Devonshire Tramroad.

By H. L. HOPWOOD.

AS precursors of the modern railway, tramroads, or "wagon-ways" as they were then called, are known to have existed in the North of England previous to the year 1618. In the latter half of the eighteenth century, such wagon-ways had become quite common, more than a hundred miles being laid in the colliery districts of Northumberland, Durham, the Midlands, Monmouthshire and South Wales. At first these tracks were formed of wood, but gradually, in order to overcome friction and prevent undue wear, iron strips were laid on the wooden rails. Later on, iron rails became general, the first iron "plate-way" being laid at Coalbrookdale in 1767 and the first "edge-rail-way" at Loughborough in 1789.

One does not expect to come across these tramroads away from a mining district, least of all in Devonshire; but on Dartmoor there are to be seen traces of one which dates back to 1820. This line* was built for the conveyance of granite from Hey Tor Quarries and was unique for the reason that the track was formed of granite blocks: this at a time when iron rails were in general use elsewhere. The employment of granite was due to the fact that this material was obtainable in large quantities in the locality and was cheaper than iron rails, the carriage of which, from distant parts to the then inaccessible Dartmoor, would have been an item of considerable expense.

The granite blocks forming the track varied in length from 4 ft. to 8 ft. and were about 1 ft. wide and 1 ft. deep. Laid to a gauge of 4 ft., they were merely put in line with one another, without being joined, and were roughly hewn, only the ends being dressed sufficiently to make a tolerably good fit between one block and the next. On the running surface, the blocks were cut so as to form ledges on the inner sides, thus ⌐¬ ⌐¬, and in section they were similar to the so called Outram "plate-ways" found on many contemporary tramroads.

Photo] [*H. L. Hopwood.*

REMAINS OF THE HEY TOR GRANITE TRAMWAY.

Photographed near Bovey Tracey, 1910.

The making of the Hey Tor Granite Tramway was due to the enterprise of a Mr. Templer, the then owner of the quarries, and being built for his private use, no Act of Parliament was necessary. Opened in September, 1820, and worked by horse power, the line originally extended from the granite workings on the north side of Hey Tor Rocks to a canal where Teigngrace station now stands, a distance of about 7

* This is not the only tramroad in Devonshire, there being also the Plymouth and Dartmoor, opened in 1823. See RAILWAY MAGAZINE, December 1908, page 473.

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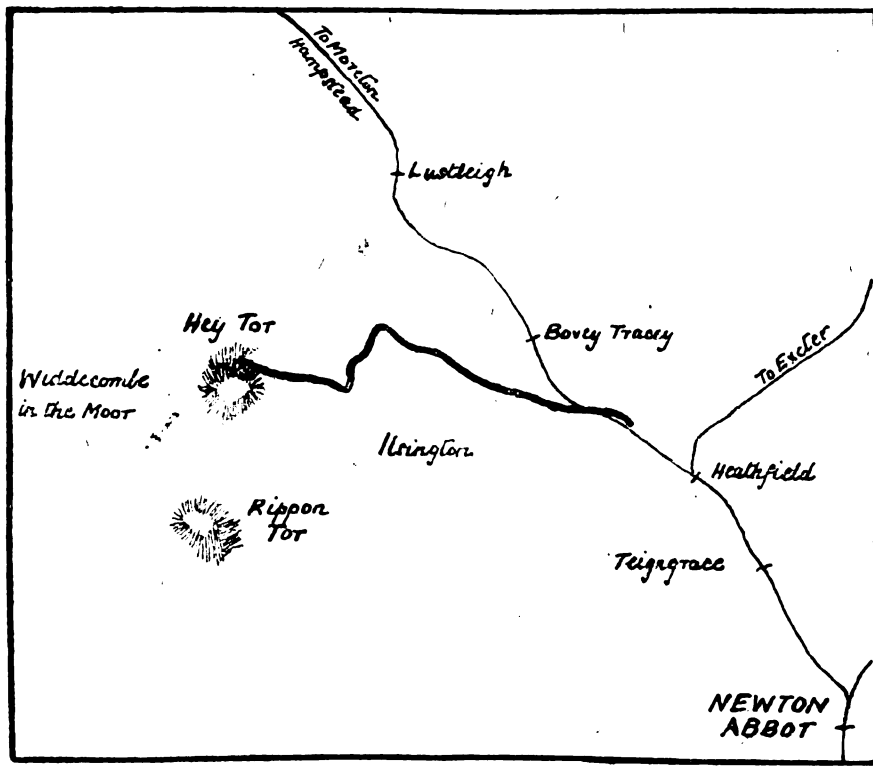
miles. In its run down from Hey Tor, the line dropped nearly 1,200 ft., so that the gradients must have been very severe. At Teigngrace the traffic was transferred to barges and taken to Teignmouth for shipment.

In 1829 the quarries and the tramway passed into possession of the Duke of Somerset. The tramway fell into disuse about the year 1858, and a portion of the lower end of it, at Teigngrace, was made use of when the Moreton Hampstead branch of the South Devon Railway was constructed in 1862. The canal, with which the tramway connected, is also in derelict condition.



MAP OF THE HEY TOR GRANITE TRAMWAY.

During 1908 and 1910 the writer explored portions of what was then left of the line. At that time, after lying derelict for forty years, the track was naturally in bad condition, and looking at the remains, without previous knowledge of the subject, one would be puzzled to know what was represented. The accompanying photograph, taken near Bovey Tracey in 1910, gives some idea of the appearance of the track at that date. Much of the intermediate portion of the line had then disappeared. The sketch map on this page is reproduced from an old map of Dartmoor and shows the course of the line, except that part between Bovey Tracey and Teigngrace, which, as already stated, was utilised when the Moreton Hampstead branch railway was made in 1862.

From the remains of wagons found at various times, it would appear that these vehicles were about 13 ft. in length, with a wheelbase of 10 ft. The wheels, 2 ft. in diameter and 3 in. wide on tread, were loose on the axles, the tyres being flangeless. The wheels were kept on the track by means of the ledges on the inner sides of the stone blocks.

Primitive as the tramway was, it conveyed a good deal of heavy traffic in its time, as some of the granite for London Bridge and that for the columns of the old General Post Office was quarried at Hey Tor and reached London *vid* the old Hey Tor Tramway in the early days of its existence.

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The Swiss Federal Railways.

By DONOVAN H. LEE.

THIS is the name of the Swiss Government Railways which own 1,510 out of 2,980 miles of the total mileage of Swiss Railways, As the total area of Switzerland is only 15,900 square miles, the number of miles of line per 100 square miles area is the third greatest in the world, and the second greatest on the Continent; the figures being, Belgium, 47·2, United Kingdom, 19·3, and Switzerland, 18·7, miles, per 100 square miles. These figures show that Switzerland is very well served as regards railways, but this was not the case in 1847, when the first piece of line was opened between Baden and Zurich, a distance of 13·6 miles. Since then railways were constructed rapidly (all privately owned), till in 1903 there were five big companies and numerous lesser ones. The five were namely: 1. The St. Gothard (Chiasso-Lucerne); 2. The Union Suisse (Winterthur to Coire and St. Gall); 3. The Central (Basle and Lucerne to Thoune *viâ* Berne); 4. The North Eastern; and 5. The Jura-Simplon. The taking over of these lines by the State created the railway which is the subject of this article. The routes of these lines will be seen on reference to the map. At the present time the Federal Railways employ 27,000 men including the locomotive works at Winterthur and the carriage shops at Neuhausen (near Schaffhouse). The locomotive stock numbers 1,270, the six-coupled types being by far the most predominant. Mogul type engines haul practically all the semi-fast and slow

trains; the driving wheels being about 5 ft. 9 in. The 4–6–0 are used for the long-distance trains such as the Basle and Zurich–Geneva expresses, but for size they are not to be compared with say the London and North Western Railway "Sir Gilbert Claughton" class, as besides the driving wheels being smaller the boilers are of small diameter. Both the Mogul 2–6–0 and 4–6–0 types have the cylinders and valve gear outside, and are decidedly neat in appearance. There are also a few of the

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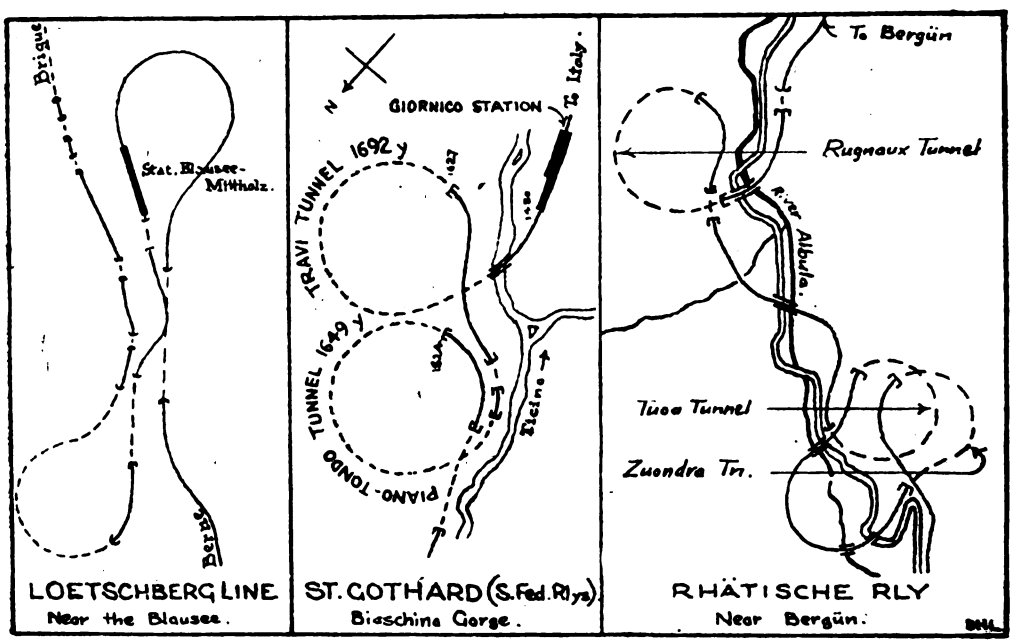
2–8–0 and 4–4–0 types; the latter being old Jura-Simplon engines, an illustration of one appearing on page 223 of the RAILWAY MAGAZINE for May, 1917. These engines are usually used on their old line, *i.e.*, between Brigue, Lausanne and Neuchatel. The scarcity of tank engines is however rather noticeable, especially as the lines of the Companies have so few tender engines; but this is accounted for by their short lengths of line.

So far electrification has not been carried out to any great extent, but undoubtedly the time is not far away when the Swiss Federal Railways will be totally electrified, in which case the tremendous energy of the

£2,900,000 and it took eight years to construct, *i.e.*, from 1898 to May, 1906, when it was opened. This tunnel considering it is trans-alpine is very low, the maximum altitude being only 2,300 ft.

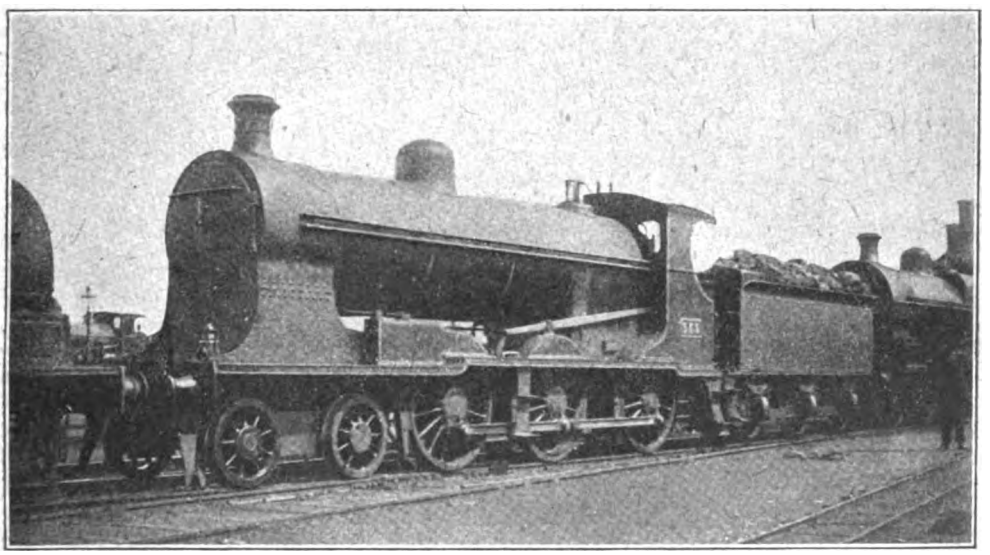
The construction was attended by numerous difficulties, amongst which were hot springs which made working unbearable, the temperature at times rising to 127 degrees Fahrenheit. The St. Gothard, although not so long as the Simplon took longer to build as it has such a large cross section, viz., 19 ft. by 26¼ ft. In the construction of the St. Gothard, also, there was not so much experience at hand as it is one of the first long tunnels, and this is shown,


Brigue
Stat. Blausee-Mitholz.
Berne
LOETSCHBERG LINE
Near the Blausee.
N
GIORNICO STATION
To Italy.
TRAVI TUNNEL 1692 y
TUNNEL 1649 y
PIANO-TONDO
Biasca
Biasca
ST. GOTHARD (S. Fed. Rlys)
Biaschina Gorge.
To Bergün
Rugnaux Tunnel
River Albula.
Tiefencastel
Tiefencastel
Tiefencastel

marked on the map with a cross. During 1915, three new lines necessitating long tunnels were completed, viz.:—The Mont D'Or Line (tunnel 3¾ miles), The Lower Hauenstein Line (tunnel 5½ miles), and the line between Moutier and Granges (tunnel 5½ miles). The latter, although worked by the Swiss Federal Railways, is owned by the Loetschberg Railway. The first of these is the most important as it saves practically 10 miles between London and Paris and Italy (*viâ* Simplon). The steepest gradient is reduced to 1 in 66 instead of 1 in 40 on the old route *viâ* Pontarlier. The new route has also the additional advantage of being double throughout, and should prove a great facility for after-the-war trade development between this country and Italy. The carriage stock is composed chiefly of six-wheel carriages for local trains and of eight-wheel bogie stock for the expresses; most of them having central corridors after the "Underground" style with open platforms at the ends.

In locomotive performance the Federal Railways are not to be compared with British lines as besides having the disadvantage of bad gradients the lines are for the most part single. On many lines there are also very sharp curves which make fast running impossible; in fact Swiss Railways can be relied upon to damp the spirits of a high-speed enthusiast. The longest regular non-stop run is Berne–Olten which before the war was run by one train in winter and two in summer in 67 min., and by several others in both directions in 72 min. and under; the resulting average speeds being between 37 and 40 m.p.h. Although the speeds are not high there is a very frequent service of trains between the principal towns as well as many foreign through carriage services such as:—Paris–Delemont–Berne–Interlaken, Paris–Neuchatel–Interlaken, Paris–Lausanne–Simplon–Italy, and in pre-war days Germany–Milan *viâ* the St. Gothard. The Paris–Neuchatel–Interlaken service runs over the Neuchatel–Berne Directe Company's line between Neuchâtel and Berne. The goods traffic is also important because of the need to bring practically all the coal and iron from outside. There is only one coal mine in all Switzerland worth mentioning, that is Chandolin (near Visp); and the output can be guessed when one knows that all the mines together employ but 50 men. This has been a great source of trouble during the war as nearly all the iron and coal came from Belgium and Germany.

AN IRISH GOODS ENGINE.



Photo] [*J. Macartney Robbins.*

GREAT SOUTHERN AND WESTERN RAILWAY.
4–6–0 locomotive, No. 363, at Inchicore.

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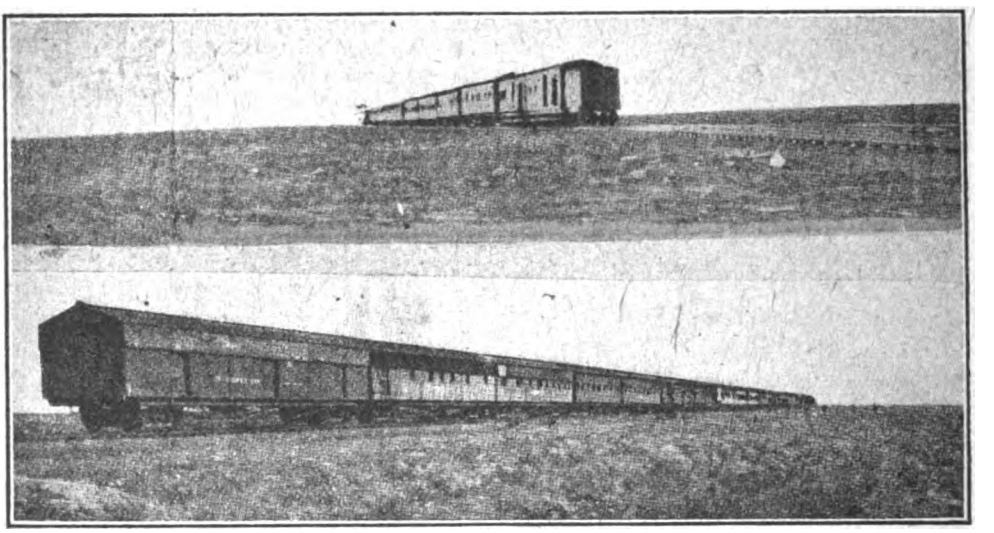
Long-Distance Railway Travelling in Australia.

IT is now possible to travel by train from Longreach (Queensland) to Meekathara (Western Australia). Few people realise that it is now practicable to travel continuously on a single railway trip in the Australian Commonwealth for no fewer than 4,892 miles. The different stages of this tremendous length of continuous railway are covered by twelve different trains, and are as follows: Longreach to Rockhampton, 428 miles; Rockhampton to Brisbane, 395 miles; Brisbane to Sydney, 715 miles; Sydney to Melbourne, 583 miles; Melbourne to Adelaide, 483 miles; Adelaide to Port Augusta, 260 miles; Port Augusta to Kalgoorlie, 1,053 miles; Kalgoorlie to Perth, 375 miles; Perth to Meekathara, 600 miles; total, 4,892 miles. The journey, while imposing on account of its length, presents its absurdities in the various breaks of gauge upon the route. From Longreach to Brisbane the gauge is 3 ft. 6 in. The gauge changes at the Queensland border until the border of New South Wales and Victoria is reached. From Victoria to Adelaide the gauge remains the same, but at Terrowie, in the journey from Adelaide to Port Augusta, there is a further break. The East-West Railway thence to Kalgoorlie is of the 4 ft. 8½ in. gauge, and then again from Kalgoorlie to Meekathara, *vid* Perth, the gauge alters to 3 ft. 6 in.

The possibility of this long-distance travelling has been brought about by the junction between the eastern and western sections of the Transcontinental railways made last autumn, when a train was first run from Port Augusta to Kalgoorlie and back. The train continued to run each way until the official opening on November 12th, and from that date there has been a tri-weekly service. The fare from Melbourne to Kalgoorlie is £9 10s. first single, and £6 7s. second single. To Perth the rates are respectively 10s. and 6s. 6d. higher. Sleeping berths are charged 10s. a night first class, and 5s. second class.

Mr. W. A. Watt, Minister for Works and



1.—TRAIN CROSSING NULLABOR PLAIN EN ROUTE FROM THE WESTERN HEAD OF LINE.
2.—MIXED TRAIN ON THE PLAIN.

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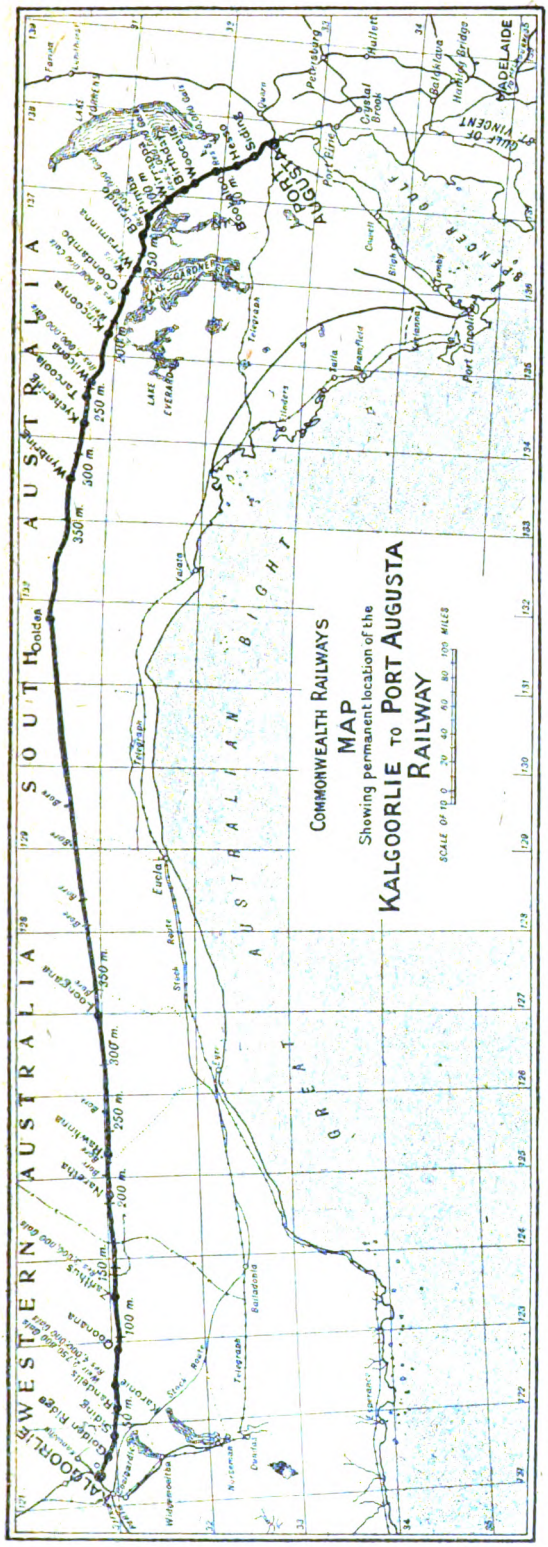

Railways, Commonwealth of Australia, has kindly supplied the following data concerning the new line :—

KALGOORLIE TO PORT AUGUSTA RAILWAY.

1. Tunnels—nil.
2. The longest bridge is at 132 miles 32 chains (from Port Augusta), and consists of 28–20 ft. openings = 560 ft.
3. Longest stretch of level line—5 miles.
4. Longest stretch of straight line—309 miles.
5. Longest stretch of line with cuttings or embankments not exceeding 3 ft. in depth—141 miles.
6. Total length of line, 1,053 miles.

Sir Ronald Munro Ferguson (Governor-General of the Commonwealth) and Lady Ferguson, who travelled overland to West Australia, arriving at Perth on November 16th last, delivered a speech at Perth railway station on arrival, as follows :—

I congratulate you on the opening of our first Transcontinental railway, which is both the "Great Eastern" and the "Great Western" of Australia. It is another of those steel highways which link up the British peoples as the Roman roads united that Empire 2,000 years ago. Australia needed this line, as Canada needed the Canadian Pacific Railway, and I am glad that Her Excellency, who, in her early days, saw the beginnings of Canada's trunk railways, as well as those of the Valleys of the Indus and of the Nile, should be with me to-day when, in the Southern Hemisphere, another link has been forged to unite great tracts of the British Empire by the greatest stretch of railway yet laid in Australia. The sea ranks first among the King's highways in the British Empire, but these thoroughfares are so essential an adjunct that we cannot rest content with even this present achievement; and as Canada has run three trunk lines across America, so must we proceed in due course to link up our south to our northern coasts, and provide feeders stretching into the outlying districts. Along the trunk lines, the absence of any great physical obstructions, the possession of metals in abundance, together with the steel works and machine shops already established, are all propitious to successful railway enterprise, while the lesson the war teaches to every British people is the necessity of energetically developing all natural resources, and making every provision to facilitate the defence of its borders. In any scheme of defence, railroads for the prompt

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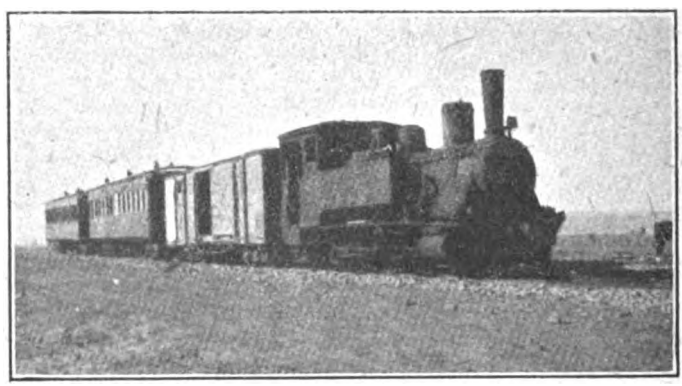
transport of troops and supplies from point to point of the territory to be defended are of vital importance. The chief hindrance to railway extension is the shortage of money, so that even in this golden land it is public and private economy which can alone provide for an adequate railway policy, on which largely depends the future of this Commonwealth. It is not to foster nomadic habits that we build railways, but to knit together this continent, to develop industries to settle land, to make provision for defence, all of which must be hung up if railway communications are insufficient.

The opening of this great connecting railway is evidence that Australia is alive to the responsibilities inseparable from great possessions. To-day we celebrate the closer incorporation of West Australia with her five sister States. The remoteness of the great and patriotic community of the West has been a weakness to the Commonwealth, and though we speak of the railway, the thought which gives point to our rejoicing is that by its means we to-day come into real and tangible contact with a great State, whose progress is personified in the lonely intrepid figure which pioneered this line of country fifty years ago in trial and tribulation, and who is affectionately recognised amongst us to-day in the appropriate capacity of Treasurer of the Commonwealth. In Sir John Forrest we have a living token of what men may accomplish in a lifetime which has seen the rise of the State with which his name is inseparably associated.

We congratulate Mr. Watt on having his name connected with the triumphant completion of this railway, and also the Prime Minister, whose fiery soul and indomitable energy ranks him with the pioneers, and has made him one of those who, in his day and generation, has upheld the proud motto, "Advance, Australia." I am sending this cablegram to the King:

"Sir Ronald Ferguson, with humble duty, begs to report to your Majesty the successful opening of the Transcontinental railway. This notable addition to the King's highways opens up new tracts of country, brings West Australia into closer unity with the sister States, and, making us independent of a sea route, should aid in releasing coastal ships for the service of the war. Sir Ronald would also convey to your Majesty an assurance of heartfelt loyalty from the people of Australia, who at a time when the world loyalty and strength of your Majesty's Empire is being tested, join with me in an expression of devotion to your Majesty's throne and person."

A PRISONER OF WAR.



Photo] [*Alex. N. B. Stewart.*

TURKISH TRAIN AT JERUSALEM JUNCTION.
Captured by the British during the recent military operations.

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Metropolitan Railway War Service.

IN the forefront to-day of things that really matter is the cultivation of all vacant land in the British Isles, and as RAILWAY MAGAZINE readers are aware by an illustrated article in August last, very considerable enterprise has been displayed by the Metropolitan Railway in bringing into cultivation the one-time waste land by the side of the line between Harrow and Uxbridge.

Instead of letting the land in small plots to tenants, its co-operative cultivation by the company's servants was taken in hand by Mr. John Wardle, the Commercial Manager, and no fewer than 15 acres were placed under crops. Women railway workers were employed and many railway men devoted their limited leisure to the venture. All were paid for their services and the produce was sold to members of the railway staff for winter consumption. How well appreciated was the effort of the railway company to meet the requirements of the staff as vegetable consumers is evidenced by the fact that 900 members of the service availed themselves of the opportunities offered. The crop comprised 40 tons of potatoes and 10 tons of turnips.

Having set its hands to the plough it is the determination of the company to go forward, and active arrangements for the season of 1918 are in progress. Mr. John Wardle and his assistant, Mr. E. Charles Short, have made great preparations to ensure the success and still further development of the undertaking so successfully inaugurated last year.

Such matters as manure, seed potatoes, onion, turnip and other seeds have received proper attention and a definite line of policy in regard to crops has been decided. First of all, it is intended this season, to grow early potatoes in order to help to meet the anticipated shortage of foodstuffs in the early summer—a time of the year when the world's food supply is usually at its lowest, either in peace or in war. A large quantity of main crop potatoes will be planted for raising in the late autumn, but a very important proposition is that after raising the early crop, the same land, after proper scientific treatment, will again be used for the purpose of growing a further late crop!

A FIELD OF 2½ ACRES PLANTED WITH POTATOES, 1917.

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Then, in addition, three acres will be given over to the growing of a variety of roots and vegetables such as onions, carrots, parsnips, etc.

The scheme does not end with growing vegetables on the company's waste land and selling the produce to the staff. Many members of the service have allotments or war gardens of their own, and for these Mr. Wardle has purchased a consignment of early seed potatoes so that they likewise may produce a crop that will tend to tide over the anticipated "tight time" that is to come before harvest.

The show will be divided into two divisions, vegetables A and fruit B. There will be 17 vegetable classes and seven fruit classes. A special prize will be given in each vegetable class for competition among plot holders of the Hospital Garden Section of the War Service Corps, for produce grown in gardens. A committee has been formed by the election of members jointly by the Garden Section and the Sports Section of the Corps, and the hon. secretary is Mr. F. Dawson, Estate Office, Baker Street Station.

The foregoing synopsis of the activities of the Metropolitan Railway in increasing

LIFTING THE CROP, 1917.

To encourage fruit and vegetable culture a show in connection with the Metropolitan Railway War Service Corps (No. 1 Section), open to the whole of the staff of the Metropolitan and Joint Lines. The date provisionally fixed is July 27th next, and it will be held at Wembley Park on the same day as, and in conjunction with, the Sports Meeting. Prizes will be given to successful competitors. All fruit and vegetables entered for exhibition must be grown by the exhibitor in his own garden or allotment, or have been in his possession for at least two months prior to the exhibition.

Britain's food supplies in these critical days shows that considerable credit is due to all concerned for the common-sense manner in which the problem has been handled. Too often such attributes as earnestness and enthusiasm are thrown away through lack of a proper and well defined policy, but this is not the case with the Metropolitan Railway campaign. Here we have thoroughness, care, forethought, and a scheme that will not only bear critical examination but is well worthy of emulation in any other parts of Great Britain where a parallel set of circumstances may prevail.

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THE RAILWAY PORTRAIT GALLERY.

SIR WILLIAM WYNDHAM PORTAL, BART., D.L., J.P.
Deputy-Chairman of the London and South Western Railway.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two queries in one month Correspondents are requested to write on one side of the paper only, and they must give their names and addresses, but pen-names or initials may be inserted for Editorial use.*

Some Signalling Queries.

We do not see any infringement of regulations in the two cases you mention. At Weybridge the double line of the Chertsey branch does not terminate as a single line, but effects a junction with the main line, the platform line on the up side being merely a spur. Numbers of similar cases could be cited. At stations like Fenchurch Street signalmen are prevented from admitting a train into a platform already occupied by the provision of electric fouling bars, on which the trains stand, and so lock the incoming signals, or in other ways advertise their presence. As regards your second query it is evident that Mr. Hadley, in using the word "section" on page 49 of his book, is doing so in a general sense, and not restricting his meaning to one block section merely. That is to say, the portion or "section" of line blocked, over which single line working is in force, may extend over several contiguous block sections. Thirdly, the number of signal boxes provided at any station is governed by the amount of traffic with which the station has to deal. In comparing Esher and its two boxes with Surbiton, Walton, and Weybridge, having one apiece, you forget that at the Sandown Park race meetings the traffic dealt with at Esher is very heavy and involves a considerable amount of shunting, marshalling, etc., for which special provision is necessary. At points on the Great Northern Railway where "up" and "down" boxes are provided at the same mileage, they control the up working and the down working respectively. They are only thus installed where traffic is very heavy, and generally at the entrance to and exit from goods "loops," etc., at which a considerable amount both of muscle and brain-work is required. In the fourth place, even where a railway employs the standard engine head-code and signal-box bell-code, it is almost invariably the practice to arrange for additional bell signals to be sent to every junction box by the box or boxes next in rear in order to give the routing of the trains from the junction and obviate errors. The bell signalling on lines such as the London, Brighton and South Coast Railway and South Eastern and Chatham Railway is generally of a special code character, based jointly on the routes to be followed by the trains and on their character.

[Reply to J. D. THOMSON.]

4-2-2 Locomotives, Midland Railway.

No. 689, 4–2–2 type, belongs to the final series of ten engines of this wheel arrangement designed by Mr. S. W. Johnson and built at Derby in 1900. The original numbering of the series was 2601–2605 (No. 2601, *Princess of Wales*, was exhibited at the Paris Exhibition in 1900) and 19–23, but the present numbering is 685–694 inclusive. These engines have larger boilers than the other "singles," and 7 ft. 9 in. driving wheels; they were also provided with eight-wheeled tenders when first built. They are easily distinguishable by the fact that the dome is well set back towards the safety-valves, instead of as in the other types, being midway between chimney and valves. The Midland singles are not now working on passenger trains because the present passenger train services as a whole are beyond their tractive powers, especially as regards the weight of the trains, and the singles are therefore more economically employed on their present pilotage duty.

[Reply to RALPH B. WALLIS.]

Steep Gradients.

The 1 in 40 gradient between Penarth Dock and Town stations on the Taff Vale Railway is by no means the steepest on an

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ordinary line of railway in this country. The Taff Vale Railway alone has six other stretches on passenger lines at this inclination, one of which is 1¾ miles long (on the Nelson branch). On the Lancashire and Yorkshire Railway there is ¼-mile at 1 in 27 between Werneth and Middleton Junction, and the Great Western Railway has the same gradient on the Letterston branch; the South Eastern and Chatham Railway boasts ⅛-mile at 1 in 28 between Canterbury and Whitstable; while the North British Railway runs to 1 in 23 for ½-mile on the Causewayend incline, and 1 in 23–31 for over a mile on the Commonhead incline. In each of these cases the routes is one followed by passenger trains, worked by ordinary steam locomotives.

[Reply to H. V. MORGAN.]

Load Ratings for Express Engines, Midland Railway.

The figures in the express train columns of the Midland Railway working time-tables to which you refer, as, for example, "Load 170, 200, 220 and 260 tons to Leicester; 180, 210, 230 and 270 tons forward" in the case of the pre-war 9.30 a.m. Scotch express *ex*-St. Pancras, refer to the maximum loads that were allowed to be taken unpiloted by the various classes of express engine on the train concerned. That is to say, for St. Pancras to Leicester a 2–4–0 or 4–2–2 engine might take 170 tons unpiloted on this schedule, a rebuilt 4–4–0 200 tons, one of the larger Johnson 4–4–0's numbered in the 700's 220 tons, and a 999 or a compound 260 tons, these being the classes—1, 2, 3 and 4—to which the figures refer respectively. North of Leicester, the road being easier, the rating was slightly increased.

[Reply to J. S. LEWIS.]

The Great Western Railway and Manchester.

We are not able to trace any record as to the Great Western Railway having ever actively competed for the passenger traffic between London and Manchester. Of the two routes, that *viâ* Wellington and Crewe has always afforded a considerably quicker journey than that *viâ* Chester and Warrington. Immediately prior to the War, the 2.35 and 6.5 p.m. expresses *ex*-Paddington both gave a service to Manchester in 5½ hours, by means of the Wellington slip-coach, while the quickest connection in the opposite direction was one of 5 hours 40 min. by the express reaching Paddington at 7.50 p.m. Suitable 2-hour London connections with the through Bournemouth–Manchester expresses, which followed the same route, might have reduced the time to 4½ hours in each direction for the journey of 205 miles.

[Reply to T. M. HERBERT.]

Maximum Speeds.

See replies to R. W. Clarke and D. F. Nicholls in the January RAILWAY MAGAZINE. We are afraid your moving story of the Great Western Railway driver who offered to run to Bristol in under the hour provided that his wife and children were cared for in the event of his untimely demise is one without foundation in fact, while such a speed as you mention between Teignmouth and Dawlish is not only highly improbable, but practically impossible of achievement at this point. The highest properly authenticated British speed was one of 102 m.p.h. down Wellington bank, Great Western Railway, by an up Ocean Mails special on May 9th, 1904. Your signal-box query is answered in the "Railway Year Book."

[Reply to V. B.]

South Eastern and Chatham Railway Locomotives.

The 0–6–4 South Eastern and Chatham Railway tank engines were designed by Mr. H. S. Wainwright, and the large-boilered 4–4–0 express engines by Mr. R. E. L. Maunsell, the present locomotive superintendent. Both types are superheated. Of the 22 engines forming the latter class, Nos. 760–771 inclusive were built by Messrs. Beyer Peacock & Co., Ltd., of Manchester, and Nos. 772–781 by Messrs. Borsig, of Berlin-Tegel. There is at present one outside-cylinder tank engine—No. 790—of the 2–6–4 wheel arrangement and of recent construction; this was illustrated and fully described in our issue of November, 1917.

[Reply to H. M. SAYERS.]

Great Eastern Railway Locomotives.

We have no data at our disposal to determine which are the "most successful" locomotives on any railway. We believe the 4–6–0 engines on the Great Eastern Railway have given every satisfaction; their driving wheels are of the dimensions you state, but their cylinders are 20 in. diameter by 28 in. stroke. The 0–6–2 engines Nos. 1000 and 1001 are purely experimental, and it is too early yet to decide as to their success in working or the reverse. You are correct in

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saying that the 2–4–2 Great Eastern Railway tank engines of the type you describe are the most recently built of that wheel arrangement.

[Reply to G. T. LADD.]

North London Railway Rolling Stock.

"Old North London engines and carriages" are still performing their time-honoured service of operating the passenger train service of that railway. You forget that the electrical working of the "Outer Circle" by the London and North Western Railway still leaves the frequent North London steam train services from Broad Street to Bow and Poplar and to the Great Northern line. A certain number of North London locomotives, principally of the 0–6–0 type, are being employed by the London and North Western Railway for shunting and marshalling at Crewe and elsewhere.

[Reply to S. T. BUCKLEY.]

Longest Platforms.

On the Taff Vale Railway the aggregate length of the platform faces at which trains can come alongside are Pontypridd station, 3,462 ft., and at Cardiff station, 1,700 ft. Other long passenger platforms in the United Kingdom are :—

Perth, main island platform	1,745 ft.
Edinburgh (Waverley) ..	1,680 ft.
Aberdeen Joint Station, No. 6	1,596 ft.
Crewe No. 1	1,509 ft.
York No. 4	1,480 ft.
Cambridge	1,375 ft.
Rugby (up main)	1,322 ft.
Leicester (G.C.R.)	1,245 ft.

[Reply to "GWALIA."]

Locomotives on the South Eastern and Chatham Railway.

No locomotives are now constructed at Longhedge Works. The 4–4–0 locomotives Nos. 760–771, officially known as class L, were built in the early part of 1914 by Messrs. Beyer Peacock & Co., Ltd., Gorton Foundry, Manchester. A complete list of South Eastern and Chatham locomotives is not available for public use. The Hull and Barnsley Railway engines at present working goods trains on the South Eastern and Chatham line, inclusive of No. 74 seen by you, are eleven in number, but no Great Northern Railway 0–6–2 tanks are performing the work you ascribe to them.

[Reply to E. P. MASTERS.]

Cheltenham Train Services, Great Western Railway.

There would not be sufficient traffic between Cheltenham and London to warrant the running of an independent service, as you suggest, but the proximity of the two fairly large towns—Cheltenham and Gloucester—has enabled the Great Western Railway to afford them, as a paying proposition, a much better combined service than either would have enjoyed individually. Not being gifted prophetically, as we remarked last month, we are unable to predict as to the proposed new and widened lines to which you refer.

[Reply to H. FISHER.]

Shunting Signals.

The letter "S" affixed on a signal arm is generally an indication that it is a shunting signal, *i.e.*, that when it is pulled off a train may draw ahead past the post on which it is fixed only as far as is necessary to clear the siding switch before shunting back. The Great Western Railway is the principal user of this type of signal. The letter "S" affixed to signals on the Great Eastern Railway, however, indicates that they apply to the "Suburban" roads between Liverpool Street and Hackney Downs.

[Reply to R. VAN DEN BERGH.]

Somerset and Dorset Joint Railway.

All the twelve 0–4–4 tank engines of the Somerset and Dorset Joint Railway—Nos. 10–13, 29–32 and 52–55 inclusive—have now been reboilered, and provided with chimneys and safety-valves of the Deeley type, which have somewhat modified their external appearance, but they have not been otherwise altered. This joint line does not own corridor rolling stock, but the corridor stock of the Midland Railway is worked through from Bath to Bournemouth daily.

[Reply to J. WALKER.]

Season Tickets.

It is the practice of most railway companies to charge the holder of a season ticket excess fare only if he travels beyond the area embraced by that ticket, *i.e.*, the fare to the station at which he alights from the nearest station covered by his ticket on the route by which he has travelled. An excess fare ticket can generally be obtained before commencing the journey, but it is more customary to pay the excess on alighting, receiving a receipt for the amount paid.

[Reply to "NORTH WESTERN TRAVELLER."]

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Bickley-Orpington Loops, South Eastern and Chatham Railway.

The spur lines connecting the old main line of the old South Eastern Railway between Chislehurst and Orpington with that of the erstwhile London, Chatham and Dover Railway between Bickley and St. Mary Cray, were opened for traffic on September 13th, 1902, some 3¾ years after the two companies concluded their working agreement as the South Eastern and Chatham Railway.

[Reply to R. W. H.]

London and South Western Branches.

Authority does not approve of the publication of details relating to military railways. Westbound trains for the Amesbury branch diverge at Grateley station, and eastbound trains for the same branch at Amesbury Junction; so far as we are aware no other points of junction than these have ever been employed. The proposed Okehampton–Torrington line was never actually commenced and the scheme has now lapsed.

[Reply to J. D. THOMSON.]

Locomotive Proportions.

There is no fixed relation between the diameter of the cylinders of a locomotive, and that of the boiler or the area of the fire-grate, but these dimensions bear some rough relation to each other, which you can easily reduce by a comparison of the locomotive dimensions which are given from time to time in the pages of the RAILWAY MAGAZINE. The equivalent in square mètres of 88 sq. ft. is 8·175.

[Reply to ANDRE SCHEFER.]

10.15 a.m. Express *ex*-Paddington, Great Western Railway.

The 10.15 a.m. express calls first at Westbury, arr. 11.57 a.m., dep. 12.0 noon, then at Taunton, arr. 12.55 p.m., dep. 1.0 p.m., and arrives at Exeter at 1.37 p.m. No restaurant cars are now run on the Great Western Railway. You can obtain this information from "Bradshaw's Guide," to which we must refer you for the answer to further queries of a similar character.

[Reply to "WYKEHAMIST."]

High Voltage on Electric Railways.

High voltages are used for the transmission of electric power to sub-stations, that is, to local supply stations wherein the high pressure is transformed to the pressure at which energy is required. The transmission of heavy currents at low voltage to distant points of distribution would be prohibitive in cost of copper and transmission losses.

[Reply to R. WHEATLEY.]

Tube Heating Surface.

It is customary to reckon the external area of tubes, *i.e.*, the surface in contact with the water, when calculating the heating surface. For the sake of uniformity the heating surfaces of superheating steam tubes and the flue tubes which contain them are also generally calculated externally.

[Reply to J. D. THOMSON.]

Busiest Station in the British Isles.

You will see by article in RAILWAY MAGAZINE, April, 1917, that the distinction of dealing with the greatest number of stopping or passing trains belongs to Clapham Junction, jointly owned by the London and South Western and London, Brighton and South Coast Railway Companies.

[Reply to V. B.]

Brake and Steam Heat Train Connections.

Dual-fitted coaches carry separate piping and connections for the Westinghouse and vacuum brakes respectively. Connections for steam-heat purposes are independent of these, and involve the provision of a third flexible hose between coaches where the latter are dual-fitted.

[Reply to H. M. SAYERS.]

4-4-0 R1 Class Express Engines, North Eastern Railway.

The boilers of above engines were pressed to 225 lbs. per sq. in. when first constructed, but the pressure was reduced not many years afterwards to 180 lbs., and has been further reduced to 160 lbs. since the engines have been superheated.

[Reply to C. A. L.]

Rebuilt Midland 4-4-0 Engines.

A number of the 403–482 series of Midland 4–4–0 engines, which had previously undergone one rebuilding, have now been rebuilt a second time with the addition of superheating apparatus. A Belpaire boiler is fitted to all the superheated engines.

[Reply to H. R. GALE.]

Metropolitan Railway Gradients.

Gradient from Preston Road up to Harrow is one of 1 in 94–105 for 1⅝ miles. From West Hampstead the line rises at 1 in 87

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to the viaduct over the London and North Western Railway, and falls thence at 1 in 100 to Kilburn.

[Reply to F. T. CLIVE.]

Ealing Accident.

Record in the "Railway Year Book" is correct. The accident took place on November 18th, 1909. It was an empty electric train, and the unfortunate men who met their deaths were the motorman and the gateman.

[Reply to F. RICHARDSON.]

Great Western Railway Vacuum Brake Ejector.

The noise is made by the exhausting arrangement or ejector of the vacuum brake which is worked off the crosshead, and is plainly visible in the case of outside cylinder engines on the Great Western Railway.

[Reply to W. H. RANN.]

London and South Western Railway Superheater 4-6-0's.

None of the 6 ft. 4–6–0 engines of the 448–457 series have yet been superheated. If you will refer to the heading of these pages you will see that we do not undertake to give locomotive dimensions or numbers.

[Reply to J. H. SUTCLIFF.]

Compound Locomotives.

We are afraid that there is no general means of distinguishing simple from compound engines externally other than a knowledge of the types concerned and of their external characteristics.

[Reply to G. CHAPMAN.]

Rough Roads.

Such queries as "Which is the roughest piece of road on such-and-such a railway?" do not come within the scope of "The Why and The Wherefore," and obviously cannot be dealt with here.

[Reply to A. F.]

Exhaust Steam Injectors.

The jet of steam to which you refer is the exhaust from the exhaust steam injectors carried by these engines.

[Reply to E. A. BROTHERS.]

0-6-2 Engines, Taff Vale Railway.

Working pressure of the latest Taff Vale Railway 0–6–2 tank engines (Class A) is 160 lbs. per sq. in.

[Reply to H. V. MORGAN.]

Manx Electric Railway.

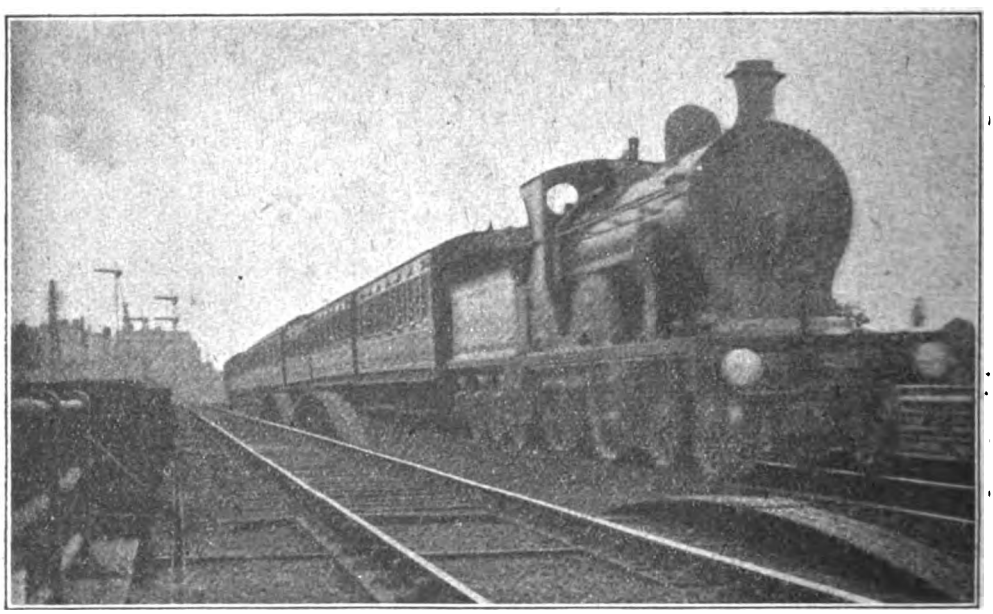
Douglas to Ramsey, 18 miles open, is 3 ft. gauge. Snaefell Mountain, 4⅞ miles open, is 3 ft. 6 in. gauge.

[Reply to "BEN-MY-CREE."]

Dover Admiralty Pier Station.

Up to the present time the new station has not been opened for ordinary railway traffic.

[Reply to R. W. H.]



Photo] [*H. M. Adamson.*

GLASGOW AND SOUTH WESTERN RAILWAY. TRAIN LEAVING CARLISLE.

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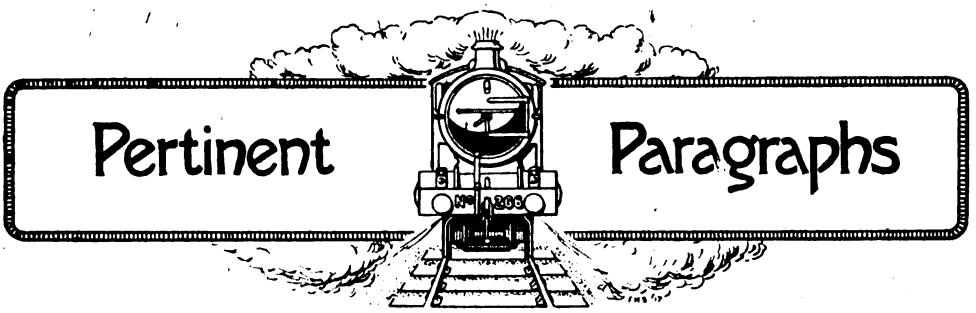

Safety Devices for Railway Carriage Doors.

Suggestions to the effect that devices may conveniently be installed whereby all doors of a railway train shall be locked automatically or closed (if open) independently of passengers are almost innumerable, and it is usual to find many suggestions in "Letters to the Editor," and not a few patent applications, following upon every newspaper reference to a fatality or accident due to child or adult falling from a train in motion. Many of the schemes advanced in this way are not only crude in conception, but more or less impracticable of satisfactory realisation, especially when they are produced by inventors whose only acquaintance with railway trains is as ordinary passengers, and who fail to appreciate what are the real conditions to be met. It may be taken for granted that all our Carriage Superintendents have given full consideration to the practical problems involved, for no railway officer views the possibility of accident occurring to a passenger travelling on his line with equanimity, if it can be guarded against by providing some device of a safety character. Witness, for example, the wide adoption of Kaye's patent wedge lock, which includes the feature of their safety catch, an improvement which has no doubt saved many a child's life, as well as many adults. There is also the railway side of the question, that a non-closed door, if struck and torn off by a train on the adjacent line, is a fairly costly matter to replace, while the vehicle itself may be seriously damaged and kept out of service until it can be repaired. Consequently, the fact that devices of the kind suggested are not adopted is *prima facie* evidence that the problem is not so simple as it appears.

Next to the Carriage Department officers, firms concerned with the construction of railway carriage door locks are most interested in solving the problem, and Mr. W. K. Kaye, M.I.Mech.E., Chairman and Managing Director of the well-known firm of Joseph Kaye & Sons, Ltd., purposes to meet it in a way which altogether differs from the usual suggestions.

We have had an opportunity of reading Mr. Kaye's complete specification and, briefly expressed, he does not propose to control the door locks directly, but instead he includes in his patent lock or striking plate an electric contact device which gives warning, by ringing a bell or operating an indicator in the guard's van, to show whether any door remains open, or is being opened, or is insecurely fastened at a time when it should be closed. The guard, therefore, knows at once whether his train is in safe condition when starting on its journey, and is immediately informed should a door be opened while travelling, and can take the necessary safety steps, even to stopping the train, accordingly. The device may also be arranged to operate the automatic brake system to stop the train.

Each striking plate in the door frame is provided with one or more spring contact pieces so arranged that when the bolt or catch of the lock is home and the door closed, an electric circuit connected with a suitable indicator is broken, but when the bolt of the lock is withdrawn and a door open, contact is made at once or restored, alarming the guard in charge and indicating to him the particular carriage and also the particular door at fault.

When all or the major portion of the doors are open during stoppage of the train at a station, there will be a general indication of open doors, and a switch may break the circuit when the train stops and complete it again when movement is re-commenced. This switch may be hand operated or if need be in conjunction with the brakes. In other forms the contact may be placed in other portions of the door frame and so arranged that the door itself or a catch thereon may operate same.

Mr. Kaye does not, of course, claim that it would prevent a child opening a door and falling out before anything could be done to save it, but it is at least a commendable idea whereby such causes of accident may be safeguarded, and is undoubtedly a step in the right direction, especially as Mr. Kaye is necessarily in a position to know what he is doing in working out the practical details of his invention.

Straight Railways.

On the question of straight railways recently dealt with in the Railway Magazine, the Rev. J. B. Baron Collins contributes the following interesting item :—

I have just finished reading a little book on America, "A Visit to the States," being reprints from the *Times* of 1887, 1st series. On page 280 is a reference to the New York, Philadelphia, and Norfolk Railway, or Railroad, as it is there called, stating that in one part it passes through much forest over a level surface in a flat country, which has enabled the railway builders to lay a mathematically straight line for nearly 90 miles—said to be the longest tangent in the States. Near this straight

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stretch is a great peach-producing district with special peach trains to convey the fruit in 12 hours to New York, 20 to Boston and 30 to Montreal. Not only is there a Portsmouth and a Gosport in one part of the States, but, as in England, there is a large strawberry-growing district near by, with a considerable traffic by rail and sea of that fruit.

Electric Railways.

On this page there is an illustration of a dining-car train on a Swiss Electric Railway. The original photograph was taken by Mr. E. A. Gurney-Smith while travelling in the train to Chateau d'Œx.

On the subject of electric railways and the possible development of power from natural resources in Great Britain and elsewhere, Mr. Gurney-Smith writes :—

Could not this be made the occasion for some remarks as to the urgent need for developing our own sources of power in England so as to save coal ? Of course, we have nothing like the amount of water power available in England that they have in Switzerland, but still we have a good many. Travellers between Sheffield and Manchester on the Great Central Railway will all be familiar with the Manchester water supply works just after passing the Woodhead tunnel. Surely there is enough power available there to drive the whole of Manchester. Electricity ought to be ever so much cheaper and more in general use. And there are many other sources which are not dried up in the summer. I believe that most of these splendid clean electric railways in Switzerland are entirely driven by water power from quite small streams.

In the train here shown there were carriages of all three classes, the first and second most beautifully, and, indeed, delicately, upholstered (and owing to the absence of smoke and dust they are kept almost like a drawing-room), and also a restaurant-car.

I have just heard from Ceylon that they are reducing the trains there to the minimum owing to the coal transport difficulty, and that they are using wood wherever possible. Surely they could get enough power from the lakes at Nuwara Eliya and Kandy, etc., to drive a great section of the railways. And some of the running conditions would be the same as those in Switzerland, the need for rapid acceleration after the many curves.

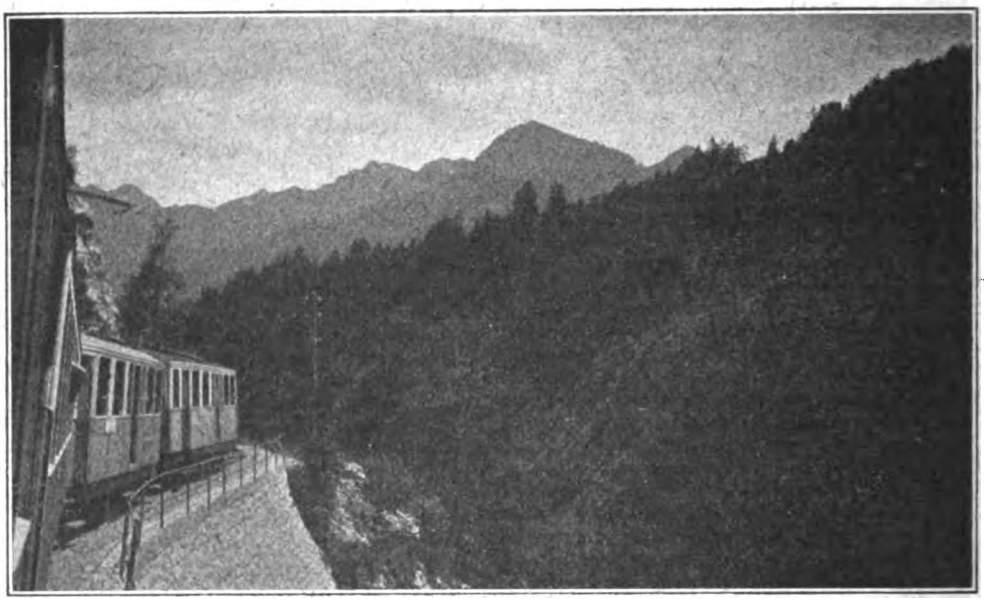

Photo. [*E. A. Gurney-Smith.*

CHEMIN DE FER ELECTRIQUE MONTREUX-OBERLAND-BERNOIS, CHATEAU D'ŒX DINING CAR TRAIN.

British wounded soldiers sent from Germany to Switzerland travel over this line.

Post War Developments.

"H. L. L." writes :—

We are all thinking, while doing our best to "stick it," without "grousing," of the developments which ought to and appear likely to occur at home when the war is finally over and we can start on reconstruction. I had intended, as an old and regular reader, writing this letter a week or so ago, but thought I would wait for the February number. I could not have found anything more to the point, as a text on which to hang my argument, than the illustrations on two consecutive pages, 97 and 98, of Midland goods or mineral trains—both double-headed. Not that I am surprised to see evidence that the practice is common, at any rate on the Midland. I suppose the exigencies of the time make it a necessary evil. But it is

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emphatically how not to do it for the future. I may be wrong, but I believe that in our railways, as in the state, we can never return to the *status quo ante* after the war. The era of indiscriminate competition, especially the ruinous competition in facilities, has gone for good, and that of co-operation has set in. The producer, rather than the consumer, must be catered for. Instead of the railways looking for traffic, the traffic of the future will be just as much as they can handle, with the most improved facilities and drastic economy of men and money. The ruling factors for a long time will be shortage of men, and shortage of ships. Competition by coasting steamers is practically eliminated. Mineral traffic and other traffic in heavy goods will crowd the railways, while parcel traffic and "smalls" especially over short distances will more and more gravitate to the road motor. Mails will before long be carried by aeroplane. Passenger trains will be heavier than ever, because fewer than before the war, but not so fast; but it is reform in goods and mineral traffic which will be urgent. It is well known there is a scarcity of locomotives and trucks; hundreds of the former and thousands of the latter have gone to the fronts and may never return; probably most of them will not be worth bringing back. And what is to replace them, and the others that would have been built, but for the war?

I submit that the time has come, and, indeed, is overdue, for the adoption on a large scale of the high capacity bogie wagon or "freight car" for coal, minerals, and general traffic between large centres. The obstacle in the past has simply been, apart from the ingrained conservatism of the railway service, the refusal of the colliery companies to modernise their loading plant. Well, they will have to in the future—they are controlled by the nation. The Government will have to see that they move with the times. The adoption of the 30 or 40-ton coal wagon on any considerable scale will enable rates to be reduced and big economies to be effected in haulage and siding space. But it is also bound to entail the use of more modern methods of traction than "double-heading" trains. We shall have to follow—at a long distance behind—American example. If, as I believe, my argument is sound, we shall within a year or two of the end of the war see far bigger and more powerful engines on our main lines, hauling goods and mineral trains up to 1,500 or 2,000 tons in weight. I suggest they will naturally fall into two types, one 4–6–2 for heavy fairly fast goods, and the other the "Mikado" or 2–8–2 type for the heaviest mineral trains. I wonder which of our lines will be the first to produce a 100-ton locomotive. I remember many years ago seeing in an American journal an account of the first 100-tonner turned out over there—I think it was for the Great Northern Railway (U.S.A.) (*i.e.*, 100 American tons of 2,000 lbs., roughly equal to 89 English tons). It did not long remain the biggest engine—and now it would be there considered quite small. I have been looking at recent American railway journals in the Patent Office Library, and the developments in tractive power in the last few years have been prodigious. I don't say we can approach them, but we are bound, especially with fewer men, and higher wages and prices, to move steadily in the same direction. The 2–10–2 type appears to be getting standard there now for heavy freight—I don't count the Mallet, which is really two engines in one, and used on exceptional work.

I would particularly refer you to the illustrations and description of a recent 2–10–2 turned out by the American Locomotive Company for the Wabash Railroad. I always used to think the Wabash was a second-grade line, or "road," as they say, and it would be very interesting to have particulars of the roadbed construction that will stand the weight of this engine. It weighs 395,000 lbs., or, say, 175 English tons, with tender of 196,000 lbs.; its cylinders are 29 by 32 in., and its heating surface 5,370 sq. ft. The load on the five driving axles is 314,000 lbs., or, say, 28 tons to each axle. Could any English lines or bridges stand it? It looks as if the flat-bottomed rail was the best for heavy loads. And these monsters have been built to haul, and can haul, a 5,000-ton train, instead of the 3,500-ton train of the engines they have superseded. And we are content with 500-ton trains! Another reason why we must wake up and move ahead is to be found in the inevitability in the first few years after the war of the construction of the Channel Tunnel and the probable reconstruction of the South Eastern and Chatham Railway to admit the passage of Continental vehicles and locomotives. When one considers the hundreds of thousands of gallant lives, and the millions of money which the Channel Tunnel would have saved us, it makes one sick to think, how foolish we were to obstruct it. But that is another story.

A few days after the above was written, the following appeared in the Press:—

"Mr. Lambert asked the First Lord of the Admiralty whether a cargo vessel which for some time has been carrying home-grown wheat from Sutton Bridge, King's Lynn, and Wisbech to Newcastle was recently sunk with 1,200 tons of home-grown wheat on board.

"Sir L. Chiozza Money replies in to-day's Parliamentary Papers that the vessel was sunk by the enemy. He adds that food-stuffs are only carried coastwise when there is an absence of inland transport facilities."

This unfortunate incident may well serve to re-inforce the contention made in the above letter, and that, notwithstanding the fact that, as it afterwards appeared, the cargo of the vessel lost was only 1,250 quarters, or about 300 tons. Three such cargoes ought to have been one train load.

Great Western Railway 4-6-0 Goods Engines.

So far as my own experience is concerned, your reply to Mr. J. S. Searls, on page 120 of the February issue is correct, writes Mr. L. B. Hewitt. The first 4–6–0 inside cylinder goods engine of

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Mr. Dean's design which I can remember was No. 36, built in 1897. This engine is alluded to (but not illustrated) in Vol. 1 of the RAILWAY MAGAZINE. She was there stated to have hauled a 450-ton goods train through the Severn Tunnel in 10 min. For a train of this weight two of the goods engines of the type then in general service were needed, and the time allowed to traverse the tunnel was 18 min. No. 36 weighed, with tender, 91½ tons. The driving wheel diameter was 4 ft. 6 in., and the inside cylinders were 20 by 24 in. There was an extended smoke-box, and raised fire-box, as fitted to the famous 7 ft. 8 in. "singles" (4-2-2), but longer. There was a large brass dome, as usual at that period of Great Western design, and all the wheels had outside bearings. No. 36 was nicknamed "The Crocodile," presumably owing to her then exceptional length. She was not named, was never multiplied, and has been scrapped for some years.

The year 1900 witnessed further developments in goods engine design. From about this period date two new 2-6-0 types, afterwards standardised to form one class. No. 33 (now 2600) was the first of a type now numbering between 70 and 80 in all. The driving wheels are 4 ft. 7½ in. in diameter, and the leading wheels have inside bearings. These engines were multiplied by both Mr. Dean and Mr. Churchward, and in due course the domeless parallel boilers were replaced by the covered pattern, top-feed apparatus following at a later date. All, I believe, are still in service. About the same time appeared two variants of the type. No. 2601, belonging to approximately the same period, had a leading bogie with inside bearings, instead of the two-wheeled truck. The smoke-box, though extended, was not supported on a saddle, as with No. 33, and the general appearance was far more clumsy. The sand-boxes were placed on the boiler barrel, immediately behind the chimney. A domeless parallel boiler was again employed. The engine having the next consecutive number, 2602, had a similar boiler and other fittings, but the wheel arrangement was 2-6-0. After No. 2601 the Great Western built no more 4-6-0 *goods* engines.

These 2-6-0 engines were colloquially styled "Caterpillars." The entire class of 2-6-0 inside cylinder goods engines has now been altered to correspond with the modified No. 33 mentioned above. Some years ago the 4-6-0 variant, No. 2601, was converted to the 2-6-0 type, and I saw her in this state as recently as January of this year. The 2600 series are often known as the "Aberdare" class.

An Economy in Locomotive Working.

FOR the drawing reproduced on the opposite page, the RAILWAY MAGAZINE is indebted to Mr. H. N. Gresley, Locomotive Engineer of the Great Northern Railway. It illustrates the arrangement employed by him for increasing the life of one of the bearings of the Walschaerts' valve gearing as used on the 2-6-0 type locomotives built for working passenger and fast goods trains.

It has been found that the bearing at the rearward end of the eccentric rod on the return crank pin wears more rapidly than any of the others incorporated in the gear, and for this reason Mr. Gresley decided to try the effect of applying a ball bearing at this point. The drawing sufficiently explains itself, and it will be seen that the arrangement entails but very little added complication of detail. The bearing employed is of the caged type, made by the Skefko Ball Co., Ltd., of Luton.

Mr. Gresley states that the arrangement has been running on a 2-6-0 type locomotive for over 12 months, and after completing some 40,000 miles the bearing shows no appreciable wear whatever. It is dust proof, and grease is used as a lubricant. The bearing is very easily got at, and to remove it it is only necessary to knock out the split pin, after displacing the end cover, and the ball bearing can then be taken down in its entirety with every facility.

As a feature of development in locomotive practice the arrangement, although in itself of a most simple character, has considerable importance. It is not infrequently alleged that a weakness of the Walschaerts' valve gearing is found in the number of pins necessitated, and that the efficiency of the gear for steam distribution purposes is, in course of time, affected by wearing of the pins and consequent lost motion which in the aggregate affects the movements of the valves themselves. The use of ball bearings at points where wear is found to be excessive provides a means of overcoming this drawback, and it will not be surprising if in the future the plan now applied by Mr. Gresley, and which, as the facts show, has been attended by such satisfactory results—is more generally adopted in the future, where similar conditions arise.

Simplified Railway Tickets.

A SIMPLE method for the easy recognition of the different kinds of railway tickets has been introduced on the London and South Western Railway. Of tickets for ordinary passengers, tourists, excursionists, short week-enders, long week-enders, golfers, soldiers, commercial travellers, marketers, workmen, there seemed before the war to be no end. Many have for some time been suspended, but sufficient to puzzle newly-appointed booking clerks and collectors have remained, and, in addition, it was a common experience for a ticket examiner to find that in a compartment fully occupied with passengers for the same destination no two of them held similar tickets, and he required to have a very intimate knowledge of the many varieties of tickets and their conditions to know at a glance whether each ticket was available for the journey or whether excess fare should be demanded.

As a matter of fact, no fewer than 250 different ticket markings, each one indicating some specific condition of travel, were formerly in existence, and to memorise them all constituted no light feat for the examining staff. The new system abolishes more than 200 of

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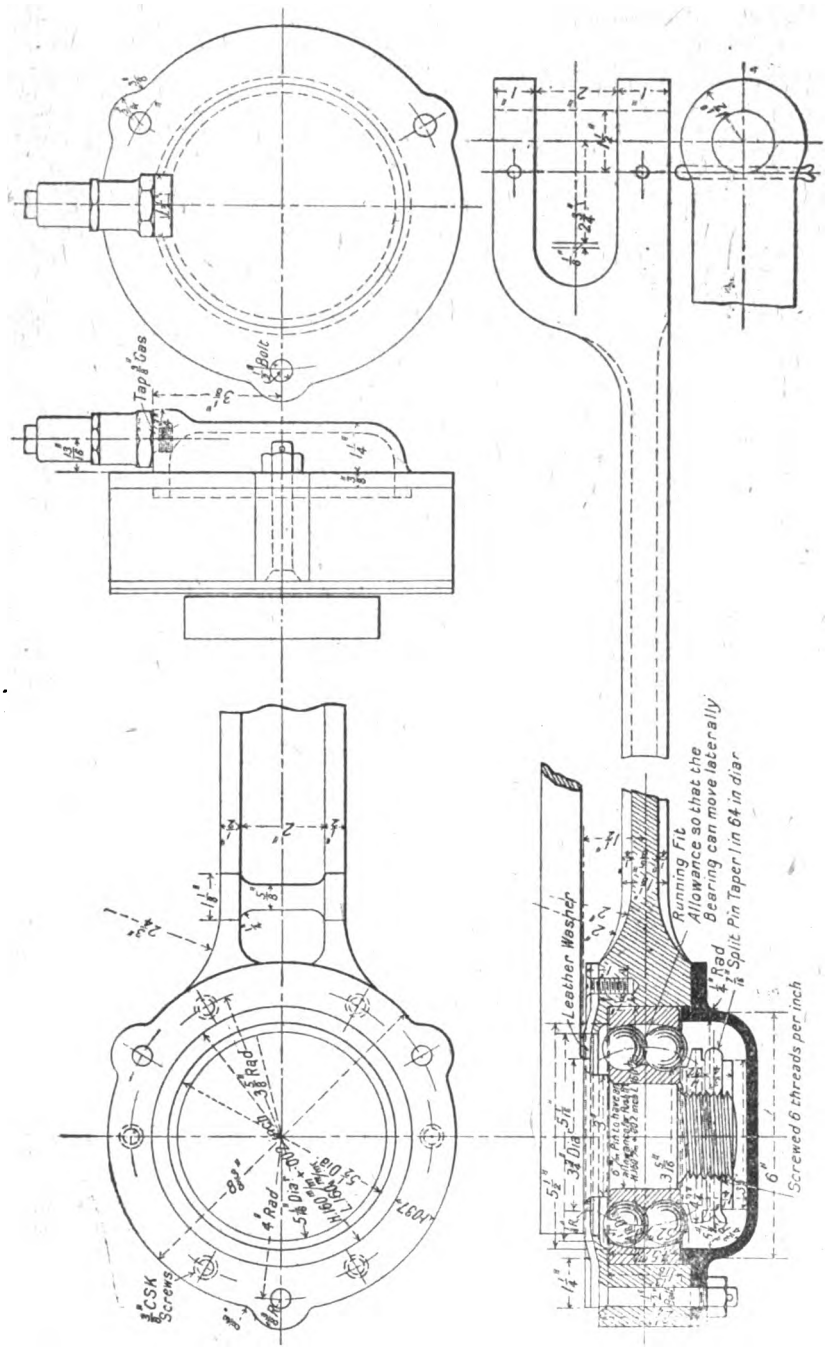

DETAILS OF BALL BEARING ON RETURN CRANK OF WALCHAERTS' GEARING, GREAT NORTHERN RAILWAY.

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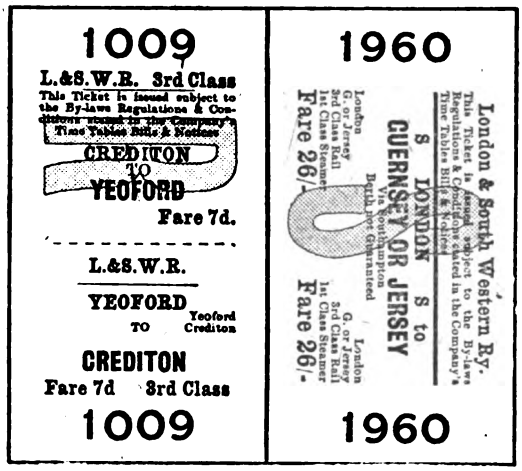
these varieties, and now some two dozen practically self-explanatory markings will suffice. In place of the many differently tinted cards, the colours will be confined to white, blue, and pink, for first, second, and third classes respectively for both ordinary and special tickets. Workmen's tickets will be grey, the only exception. Special tickets will be grouped under certain heads, and distinguished by bold red letters which will be impressed in the centre of single tickets, and on the back halves of return tickets, as shown in the accompanying diagram. Ordinary workmen's tickets will bear the letter "W"; early workmen's, "E.W."; and such tickets to places on the District railway, "D.W." or "E.D." respectively.



SPECIMEN TICKETS SHOWING THE NEW METHOD OF MARKING.

Tickets issued at Government rate will bear the letters "G.R."; tickets available second or third class by train, but saloon on steamer, will bear the letter "S." It will be observed that the initial in each case gives a clue to the special conditions governing the issue of the ticket. The return halves of all ordinary tickets will bear the letter "R," and of staff privilege tickets the letter "P." This position of the initial lettering will enable the collectors to readily distinguish between the forward and return halves of tickets, and therefore the X which formerly served that purpose will be omitted.

The simplification of examination is not the only advantage of the new arrangement; facility of manufacture is another, for the dispensing with the old intricate markings will in most cases admit of the tickets being printed and installed in one operation, saving much time and labour. Fewer tints being employed, the difficulty of obtaining coloured cards is considerably lessened. The stock of cards required to be kept on hand for ticket-making can also be considerably reduced, and the space utilised for other purposes. Altogether the innovation is of considerable importance.

In place of the card residential season tickets hitherto used by the London and South Western Railway staff, disc tickets have this year been supplied. These are in the same style as those issued last year to the public. The ticket proper, printed on very thin white card, gives the name of holder, class, between what points available, date and the number, and is tinted to correspond with the class of ticket. It is enclosed in a neat brass and enamel case about the size of a half-crown, the colour of the enamel likewise corresponding with the standard class colour—viz., white for 1st, blue for 2nd, and light red for 3rd class. A fastener for affixing the ticket to watch-chain, wristlet, etc., completes the design. The Great Eastern Railway is adopting a somewhat similar design for its staff tickets.

Stamping Parcels for Railway Transit.

FROM Sunny Spain, a RAILWAY MAGAZINE subscriber, "G. L. B.," referring to the article on this subject by Mr. J. H. Jackson, in the January RAILWAY MAGAZINE, remarks:—

"I shall be much obliged if your contributor will inform me how such parcels are sent by train: *i.e.*, whether if no way bill is made no documentation whatever accompanies the parcel to destination, and if so, what is there to prevent the parcel being lost or stolen, and how can the weight be checked? Do train guards and receiving station or junction transhipping clerks give signatures for the parcels, in the same way as used to be done for "value" letters? Otherwise it appears that there would be no check, or safeguard. I suggest that your contributor is in error as to the London and North Western Railway being the first to use parcel stamps, in 1898. I remember them in use on the Lancashire and Yorkshire Railway in the 'eighties, although they may have been limited then to newspaper packets."

To the foregoing communication Mr. Jackson responds:—

"No way bill is sent with stamped parcels, and no independent document accompanies the traffic. The weight of the parcel can be ascertained by the station agent receiving it, and he can tell from a charges scale whether sufficient money has been collected. If not, he has to take the necessary steps to collect the balance. Where there are special conditions governing the charge, these are indicated on the parcel by the forwarding station, and can therefore be taken into consideration by the receiving station when checking the correctness of the charges.

As regards the numbers of parcels lost and stolen, that would appear to depend very largely upon local conditions. I cannot speak of the safeguards necessary in Spain, for example, as it may be essential there for the greatest care to be exercised in passing traffic from hand to hand. As regards the railways in Great Britain, however, it must be remembered that they adopted the system generally after it had received a long and fairly extensive trial, and I

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know of nothing that would have damned it more effectually than the prospect of a large increase in claims, owing to parcels going astray or being stolen. "Parcel" traffic differs from "Goods," in that it receives a quick and ready transit, and the consignee knows almost to the minute when it will arrive. Its non-arrival, therefore, causes prompt enquiry, which is not possible in slower moving goods train traffic.

With reference to the final paragraph of your subscriber's letter. He will find, on reference to the article, that I showed the Great Eastern Railway having a parcel stamp a long time before the London and North Western Railway, but he can take it quite definitely that the London and North Western is the undoubted parent of the system now in operation. The Lancashire and Yorkshire Railway did not use stamps for their ordinary parcel traffic until some years after they had been adopted by the London and North Western."

In further reference to this subject the RAILWAY MAGAZINE is officially informed by the Lancashire and Yorkshire Railway that it was not until after the London and North Western Railway had commenced to use stamps for parcels generally in 1898, that the Lancashire and Yorkshire Railway adopted a similar arrangement, although as long ago as 1884 the latter company used stamps for newspaper parcels.

Office Organisation and Office Appliances.

AT an Efficiency Meeting held at the L.G.O.C. Training School, Milman's Street, Chelsea, Mr. H. E. Blain, Operating Manager, presiding, a paper, "Office Organisation and Office Appliances," was read by Mr. E. S. Welton, Indoor Assistant to the General Superintendent, L.G.O.C., who, after condemning the attitude which frequently regards an office staff as non-productive and non-remunerative—as, properly organised, it could be made as productive as a factory—proceeded to discuss the proper subdivision of an office into sections, which should be so organised as to work practically simultaneously, with the result that output was both quick and accurate.

He advocated that all clerical work should be passed from the head to the clerical staff, through the single medium of a chief clerk, who would then be enabled properly to organise the work, and the duties and qualifications of chief clerks and sectional head clerks were described.

The usefulness of tactful encouragement was undoubted, and frequently the method of dealing with mistakes had a bad rather than a good influence.

Differences of temperament must be understood, and the influence of personality was a great stimulus to loyalty and efficiency.

Unpunctuality was deprecated.

The writer, whilst recognising that the grading of clerical staff with automatic increases of pay ensured a definite prospect, was of opinion that the system had its drawbacks in failing to stimulate and recognise work which was above the average, and he advocated a combination of graded pay with special advances.

The more important part of the paper dealt with office appliances, a number of which were described, and were on exhibition subsequent to the discussion for the inspection of the audience. Amongst the appliances discussed were:—

Recording machines, including the Elliott-Fisher invoicing adding machine, the International Cash Register, and the Rochester Time Recorder.

Copying machines, including the Roneo duplicator, the use of a printing plant, and the "Photostat."

Sorting machine for cards and cash, including the "Hollerith."

Calculating machines, including the "Comptometer," "Triumphator," "Brunsviga," etc.

The Protectograph cheque writer.

The respective advantages of the dictaphone and the personal stenographer were described, and every-day appliances such as pencil sharpeners, letter openers, perpetual numbering machines, pin appliances, paper binders, typewriters, envelope dampers, the "Multipost," various methods of filing, the important question of office ventilation, air and daylight, internal and external telephone systems, bells, and the general lay-out of an office.

An interesting discussion followed, which was opened by Mr. C. S. Louch, Accountant to the Companies, and Mr. G. P. Barnett, Assistant to the Operating Manager, amongst those taking part being two visitors, Messrs. W. Holt, Traffic Superintendent, Metropolitan Railway, and J. Pepper, Outdoor Goods Manager, Midland Railway, who expressed their pleasure at the opportunity of hearing the discussion, and paid a tribute to the undoubted educative influence of such meetings.

Favourite Locomotives.

CONCERNING this subject, dealt with on page 60, January RAILWAY MAGAZINE, Mr. Fred. A. Neish writes:—

I must confess to a similar failing to Mr. Hewitt. It was when on my summer holiday to Pitlochry, Perthshire, Highland Railway, as a boy, that I came in contact with the locomotives which I had the most liking for and interest in. These were Mr. David Jones' engines with the louvred, stove-pipe funnels. I imagine most people would rather fancy Mr. Peter Drummond's design of engine on the Highland, his "Small Bens," "Big Bens," and "Castles," which were pretty much after Mr. John F. McIntosh's design on the Caledonian Railway, but I have never really to this day taken to these latter engines, as I did to Mr. Jones' "Straths," "Lochs," and "Big Goods," although I don't think there is any question but that Mr. Drummond's design is by far the most pleasing to the eye. I think it must have been the novelty of the louvres in the funnel which appealed to me, and Mr. Jones' locomotives were so very different altogether in

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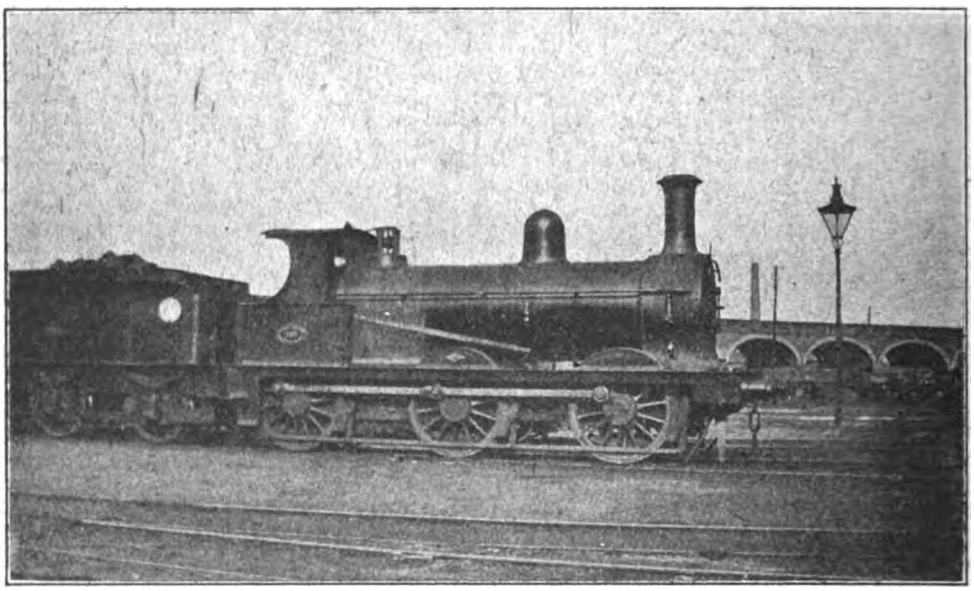
outward appearance from the Caledonian and North British engines which I saw at home in Dundee. I may add that, of all the locomotives I have seen since my boyhood days, there is not one which I would designate as my favourite in preference to Mr. Jones' locomotives with the louvred funnels, and nothing in the railway world pleases me more than to find a train headed by one of these engines.

Ahrons' Locomotive History.

In connection with Mr. Ahrons' articles on the London, Chatham and Dover Railway, "H. L. H." sends the photograph reproduced on this page. It depicts No. 135, the first of Mr. W. Kirtley's goods engines. There were six engines like this—Nos. 135 to 140, built by Dübs & Co. in 1875. Six others of similar dimensions, but of different appearance, Nos. 151 to 156, were at the same time delivered by Neilson & Co.

Readers familiar with Kirtley's later goods engines will notice that the 135 to 140 lot were unlike Nos. 151 to 156 and 193 to 198 in several details. The cabs were very similar to those of Martley's 2–4–0 "Europa" class; the sand-boxes were below, instead of above, the foot-plates; and the tender frames also differed from those of later engines. This class had 17½ in. by 26 in. cylinders and 4 ft. 10 in. wheels. The photograph is of interest for the reason that, so far as I am aware, illustrations of the 135–140 class have never before appeared in any periodical.



Photo] [*H. L. Hopwood.*

LONDON, CHATHAM AND DOVER RAILWAY.
No. 135, the first of Mr. W. Kirtley's goods engines.

London "Safety First" Council.

In view of the important relation the campaign that is being conducted by the London "Safety First" Council the first annual report and statement of accounts, 1917, presented at the first annual general meeting of the Council at Caxton Hall, Westminster, S.W., on Monday, February 18th, is worthy of note.

The Right Hon. Lord Sydenham, of Combe, presided and the adoption of the report was moved by Mr. W. Joynson-Hicks, M.P., and seconded by Sir Edward Smith, M.P.

Railway Magazine readers have been kept advised during the past year of the activities of the Council, particularly to those relating to safety in travel and in railway working, thus rendering superfluous a recapitulation of the report. The latter, however, was very comprehensive and reflected considerable credit on Mr. H. E. Blain, London Underground Electric Railways, and his joint hon. secretaries.

As a "foreword" the following interesting contribution prefaced the report:—

To the United States of America belongs the honour of having initiated the "Safety First" movement. Several years ago, certain of the American Railway and Transit Companies made a determined effort to reduce the number of accidents which occurred on their systems. Careful and thorough investigation was made of primary causes and remedial measures were devised. Employees were educated to think of, and to practise, "Safety" methods, not only in their own personal interests, but in those of the millions of passengers for whose safe transit they

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were individually and collectively responsible. They were also taught that greater efficiency led to fewer casualties, and that accident prevention was attainable only by a combination of sound methods, cool judgment, care and caution.

Remarkable success attended the efforts of these Companies. In addition to minimising a formidable loss of life and limb, and alleviating untold human suffering, the campaign was the means of saving large sums of money formerly paid as compensation and for losses of wages. In due course, the movement spread to all the industrial centres, and it was further demonstrated that the prevention of accidents was not only eminently humane, but of vital importance to employers and employed. By the installation and maintenance of safeguards to machinery in workshops and factories, and the adoption of other "Safety" methods, a very considerable percentage of industrial casualties was eliminated "Safety" Engineering, as it is termed in the United States, has become a recognised profession, and has attracted men who specialise in the design and application of "Safety" devices.

In the United Kingdom, "Safety First" campaigns were first launched by the Great Western Railway, the London General Omnibus Company, the London and South Western Railway and the London Underground Railway group. All have reason to be satisfied with the successful results which have attended their efforts.

A close analysis of statistics shows that accidents are due in main to thoughtlessness, carelessness, and, in some cases, recklessness. The elimination of these factors can only be effected by educational methods. The exercise of care and caution must everywhere be advocated, and indelibly impressed upon the minds of the community. Indeed, if a full measure of success is to be achieved, the first consideration must be the education of school-children, on the assumption that "Safety" principles inculcated in childhood will continue to bear fruit in after life.

The preliminary activities of the London "Safety First" Council have been devoted to the conservation of life, limb and property in the Greater Metropolitan Area.

The time is opportune to remember that no effort should be spared to repair the wastage of human life resulting from the greatest war in history. Every casualty avoided, whether in the home, in the street, in the workshop, or on the railway, will tend to the consummation of this ideal, and thus bear out the contention that accident prevention is a matter of national importance of the first magnitude.

"Banking" at Exeter.

By the courtesy of the London and South Western Railway the RAILWAY MAGAZINE is able to illustrate a train ascending the incline from St. David's to Queen Street station at Exeter and to furnish the following particulars.

The gradient is 1 in 37, and the ascent commences immediately after the Great Western Down Main Line is crossed, terminating at the entrance of Queen Street station, the distance being about half a mile.

ST. DAVID'S—QUEEN STREET INCLINE.

The maximum passenger train load for one engine is 40 wheels, some engines being capable of hauling a train of 36 wheels only. When the load necessitates an assistant engine it is usual to attach a banker at the rear, unless there is a pilot already on the train. In all cases where the rear vehicle conveys passengers and is not provided with a brake compartment, or the load exceeds 48 wheels, an engine is attached behind.

Should the load exceed 80 wheels, an assistant engine is provided in front as well as at the rear, and this has happened frequently during the war in dealing with heavy troop trains.

With regard to goods trains, the maximum load for one engine is 12, and all trains exceeding this load must have a banker at the rear. As a rule, a train exceeding 25 loaded wagons requires two assistant engines, one being attached in front and the other at the rear.

Generally speaking, six-wheeled coupled tank engines are used for banking purposes, but it is frequently necessary to utilise engines of other types, and it is not an uncommon thing to see a tender engine performing such duties.

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A NOTABLE CANADIAN RAILWAY OFFICER.

By courtesy] [*The Canadian Gazette.*

SIR ARTHUR H. HARRIS, K.B.E.,

the Acting Director of Oversees Transport to the Canadian Government and representative of the Director of Transports in Canada, who recently arrived in London on an important mission, is a Devonian. He is a son of the late Henry Vinton Harris, of Devonport, and was educated at the Devonport and Stock Grammar School. He went to Canada in the 'seventies, and was for some time with the Grand Trunk Railway. In 1902 he joined the Canadian Pacific Railway, since which date he has been actively engaged in initiating traffic for the company's rail and ocean services.

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MR. GEORGE J. GIBSON, whose appointment as Director of Railway Transport Ministry of Food, has been announced, is a Londoner by birth, and prior to his joining the Great Central Railway fourteen years since, was for many years connected with the London and South Western Railway, upon which line he held various important appointments. He commenced his railway career in the West of England, and was on the Staff of the Divisional Superintendent at Exeter, in which office he eventually became Chief Assistant, and during his period of office at Exeter the Company's Lines were extended to Plymouth, North Cornwall, Ilfracombe, etc. From Exeter he was promoted for special duty to the Staff of the Chief Superintendent, Mr. (now Sir) Sam Fay during the Boer War, and was afterwards Stationmaster at Winchester, and subsequently at Woking, the latter station being one of the most important junctions on the South Western Railway outside London. In 1903 he accepted the appointment of District Superintendent for the southern section of the Great Central Railway, and after holding that office for eight months was transferred to Sheffield in a similar position, and afterwards to Manchester, where he became District Traffic Manager (which office includes commercially goods and passenger traffic and operation) covering the section from Manchester to Sheffield, and Nottingham and branches. In the latter capacity he was also responsible for the movement of all heavy and out-of-gauge loads for the whole of the Great Central Line, and during the present war, needless to say, this work has been very heavy. For some months last year Mr. Gibson acted as Superintendent of the Line during the absence of Major Clow, who went to France on special duty. Mr. Gibson is also a member of the Manchester District and Mersey Ports Conference, which comprises the Goods Managers of all the Railways serving Manchester and Liverpool, and Managers of the Canals in the district.

MR. GEORGE J. GIBSON.
(Traffic Manager of the Manchester, Sheffield and Nottingham section of the Great Central Railway), appointed Director of Railway Transport, Ministry of Food.

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A PRESENTATION to Mr. O. S. Holt, by the board of directors, upon his retirement from the position of Secretary of the Great Central Railway has been made. The chairman, Lord Faringdon, said, as a board, they had already passed a resolution expressing their appreciation of Mr. Holt's services. They now desired to express to him their good wishes personally upon relinquishing his position after upwards of 40 years' service, for 25 of which he had been their secretary. He thought no one realised more than Mr. Holt did how different the present Great Central Railway's system now was, compared with the time when he first knew it. There was not a single member of the board now left who sat at the table when Mr. Holt was appointed secretary. His right honourable friend opposite (Lord Stuart of Wortley) was the earliest member of the board as it at present existed, and then he thought he followed a little later on. The capital of the company was now fully twice the amount that it was when Mr. Holt's secretarial duties commenced. It was always pleasant to be associated with a progressive undertaking, and no one was more acquainted with the growth of the Great Central Railway than Mr. Holt. He was asked by the

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board to offer Mr. Holt a canteen of silver as a token of their sincere esteem and regard. He was sorry that some of those associated with the presentation were not able to be with them on that occasion. He had there a letter from Mr. Viccars, who was still, unfortunately, confined to the house through sickness; Lord Kerry was not there, but his absence was a mere accident; Sir Berkeley Sheffield was in France on military duty, and Mr. Dewhurst was also serving his country in an important position. He knew they would have liked to have been present to testify their sincere regard towards Mr. Holt. They all, he felt sure, would desire to express the hope that in the piping times of peace, which they trusted would soon return, Mr. Holt might for many years enjoy his retirement. He was very glad to think that it was not a final parting since he still held a link with them in a consultative capacity, and he might tell them he fully intended to make use of his services in that direction. Mr. Holt, in returning thanks, stated that the valuable gift would remind him, if such were needful, of the pleasant associations of his business life, and he looked upon it as the crowning evidence of their appreciation and goodwill.

* * *

At a recent meeting of the Goods Managers' Conference, held at the Railway Clearing House, a presentation was made to Mr. W. Andrew (who retired at the end of January from the position of Chief Goods Manager to the North British Railway) of a silver tea service, and a diamond brooch for his wife. Mr. Roberts (Great Western Railway), Chairman of the Conference for the current year, in making the presentation, referred to Mr. Andrew's long service with the North British Railway, and to his membership of the Goods Managers' Conference, which extended over a period of 12 years, during which time the Conference had benefited by the experience and judgment which he had brought to their deliberations; he had been a member of the Claims Arbitration Committee for three separate periods, and during the year 1915 he acted as Chairman to that body. In 1908 he was one of six railway officers appointed by the Board of Trade to form with certain traders a sub-committee of the Board of Trade Railway Conference then being held. In conclusion, Mr. Roberts asked Mr. Andrew to accept the present in recognition of the esteem in which he was held, expressing the hope that he might live long to enjoy his well-earned retirement, into which he carried with him the best wishes of all the members. Mr. Evans (Midland Railway) also paid tribute to the assistance Mr. Andrew had rendered in recent years on demurrage matters, and the details in connection with railway work during the war. Mr. Robinson (Glasgow and South Western Railway) also associated himself with what had been said by Mr. Roberts and Mr. Evans. Mr. Andrew thanked his colleagues for their gifts, which were highly prized, and said he much valued their kindly remarks and good wishes.

It has been officially announced that Mr. H. G. Burgess, Director of the cross-Channel transportation, has been appointed by the Coal Controller to represent also the Coal Controller's Department in Ireland. Mr. Burgess's offices are at 19, Westmoreland Street, Dublin.

* * *

Mr. W. Astin has been appointed Agent and District Cashier, Midland Railway, Bristol, in succession to Mr. George Smith, deceased. He entered the service as a junior clerk at Skipton, and occupied similar positions at Bradford, Ambergate, Buxton, and Wolverhampton. He has also been stationmaster's clerk at Birmingham, canvasser at Derby, and agent at Liverpool, and was subsequently chief clerk in the General Superintendent's commercial office.

* * *

We regret to record the death of Mr. Henry Plews, a director, and formerly General Manager, of the Great Northern Railway (Ireland). Mr. Plews began his railway career with the London and North Western Railway, on which system he succeeded the late Sir George Findlay in 1865 in the control of the Shropshire and Herefordshire district. In 1867 he became Manager of what was then known as the Irish North Western Railway, a line of about 146 miles in length, extending from Dundalk to Clones, Enniskillen, Omagh and Londonderry, with branches to the westward. This system was in January, 1876, amalgamated with the "Northern of Ireland," which had come into existence the previous year by the fusion of the Dublin and Drogheda and the Dublin and Belfast Junction Railways. In April, 1876, by the amalgamation of the Ulster Railway (from Belfast to Portadown, Armagh and Clones, and from Portadown to Omagh), the "Northern of Ireland" became the Great Northern Railway (Ireland), with a length of 383 miles. Mr. Plews continued in the management of the north-western section of the line until May, 1890, when he was appointed Secretary, becoming General Manager in April, 1896. He retired from that position in November, 1911, when he was elected to a seat on the board.

* * *

Mr. William Rhoades, who recently retired from the position of Chief Claims Clerk, Goods Manager's Office, Great Northern Railway, after 40 years' service, was recently the recipient of a fumed oak roll top desk and a patent upholstered tapestry easy chair, presented to him by many colleagues and friends. The inscription on the front of the desk read as follows: "Presented to William Rhoades, Goods Manager's Office, Great Northern Railway, by colleagues and friends on his retirement in September, 1917, as an appreciation of their cordial relations extending over many years."

* * *

At a meeting of the Irish Railway Clearing House Committee the Right Hon. Sir William J. Goulding, Bart., D.L., has been unanimously re-elected Chairman of the Committee for the year 1918.

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Photo] [*Lafayette.*

THE LATE MR. JOHN F. McINTOSH, M.V.O.

WHEN early in February the death was announced of Mr. John Farquharson McIntosh, M.V.O., sometime Locomotive, Carriage and Wagon Superintendent of the Caledonian Railway, much regret was expressed in many quarters. Mr. McIntosh entered the service of the Scottish North Eastern in 1862, which line was absorbed into the Caledonian in 1866; he became a locomotive inspector in 1876, a district foreman in 1882, was put in charge of Polmadie shed—the largest on the system—in 1886, made chief of the running department in 1891, and Locomotive Superintendent in 1895. Mr. McIntosh, who retired in 1914, was President of the Association of Locomotive Engineers in 1911. In October of the same year His Majesty King George honoured Mr. McIntosh by creating him a Member of the Royal Victorian Order.

* * *

THE London, Brighton and South Coast Railway have now issued the 16th Edition of their Roll of Honour containing the names of their staff who have died on Active Service. The figures are up to the end of the year 1917 and show that the total number of men enlisted from the Brighton Railway up to that date was 4,814 which represents 29·6 per cent. of the staff, 338 have died on Active Service which is 7·02 per cent. of the men enlisted.

* * *

IN their annual report the directors of the Taff Vale Railway announce with regret the resignation of Mr. A. Beasley as General Manager, a position which he held since November, 1891. In recognition of his invaluable services and of his long devotion and loyalty, he has been invited to join the board and appointed Deputy Chairman of the company. As RAILWAY MAGAZINE readers are aware, Mr. E. A. Prosser, General Manager of the Cardiff and Rhymney Railways, has been appointed General Manager of the company. The directors also announce that Mr. William North Lewis has been elected a Director to fill the vacancy on the Board consequent upon the resignation of Lord Rhondda.

* * *

MR. E. H. DANNATT has been appointed Superintendent of the Line, Taff Vale Railway, a position which became vacant by the retirement in July, 1917, of Mr. T. E. Harland. Mr. Dannatt was educated at Kingswood School, Bath, and entered the service of the North Eastern Railway as a cadet, and was trained in railway work at Hull, Darlington and Newcastle. He was subsequently chief passenger assistant to the general manager of the Cambrian Railways. In 1911 he went to Cardiff as Chief Assistant to Mr. T. E. Harland, Superintendent of the Line, Taff Vale Railway, and since Mr. Harland's retirement Mr. Dannatt has carried out the duties.

* * *

MAJOR HENRY THOMAS RENDELL, Mechanical Transport, A.S.C., has received the D.S.O. for work in connection with the movement of heavy siege artillery in France. The son of Mr. T. H. Rendell, General Manager of the Barry Railway, prior to the war he held the position of Assistant-in-charge of the Great Western Railway road motor car department at Slough. Major Rendell proceeded to France with the first Expeditionary Force in August, 1914, and took part in the advance and retreat from Mons. In January, 1915, he was given charge of the Advanced Base Workshops, and in May of the same year appointed Inspector of Mechanical Transport of the Army in the Field, attached to General Headquarters. Major Rendell has been twice previously mentioned in Sir Douglas Haig's

MAJOR H. T. RENDELL, D.S.O.

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despatches for gallant and distinguished conduct in the field.

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IT is stated that the election of Mr. J. H. Vickery, the General Manager of the Alexandra (Newport and South Wales) Docks Company, to the Presidency of the Newport Chamber of Commerce has given great satisfaction to the commercial community of Uskside and district. His speech at the annual meeting of the Chamber revealed his studious knowledge of trade and commerce and his hopes for the further progress of Newport. He has indicated a policy which should have the effect of adding still further to the commercial well-being of the port, his remarks on the value of publicity furnishing much food for thought for that small section which still shrink from declaring what they have to offer.

* * *

DEATH occurred recently of Mr. Alexander Hannan, Glasgow, late General Agent for Scotland of the Midland Railway. Mr. Hannan, who was 69 years of age, began his business career with the North British Railway in 1863, and 40 years ago he was appointed Chief Clerk in the office of the General Agent in Scotland of the Midland Railway. In 1884 he was made District Agent for Glasgow and the West of Scotland, and in 1903 he was promoted to the position of General Agent. On his retirement Mr. Hannan received in October, 1913, a presentation as an expression of the esteem in which he was held among the officials of the Scottish railways.

* * *

IN a letter dealing with the scheme for increasing cold storage accommodation for food in the United Kingdom, Mr. John Wardle, Commercial Manager, Metropolitan Railway, and late Director of Cold Storage and Inland Transport at the Ministry of Food, says he has been inundated with requests that he should make public the reasons for his resignation, but that, at a time when every one should be busy fighting the enemy, he feels it is not necessary to make any public statement on the subject. Mr. Wardle also says: "I feel it is necessary to say that the manner in which the cold storage proprietors, dock, canal, and other authorities have agreed to spend their own capital at a time when the cost of providing the increased cold storage accommodation is approximately 75 per cent. higher than in pre-war days, in order to help to carry on the Government policy, is a matter of congratulation to the cold storage industry and the various authorities concerned, and their patriotism cannot be surpassed by any other body of the business community in the United Kingdom."

* * *

MR. GARDNER, who has recently taken up the position of Docks Engineer to the Great Central Railway on the retirement of Mr. George Cartwright, received his scientific training at the Polytechnic School of Engineering and King's College, London, and his practical training as a pupil at the Thames Ironworks, where he passed through the various shops and was engaged on the construction of several British battleships and foreign war vessels. After his pupilage was completed he received an appointment on the engineering staff of the London County Council, and in 1903 joined the Great Western Railway as an Assistant in the New Works Department under Mr. W. G. Armstrong, the late New Works Engineer of that company. Mr. Gardner entered the service of the Great Central Railway as steelwork assistant in the Engineer's Department in March, 1907, where he was engaged on most of the important bridge-works carried out

MR. A. C. GARDNER.
Docks Engineer, Great Central Railway.

under the Chief Engineer. He was particularly associated with the construction of the new Scherzer Roll Lift Bridge constructed to carry the railway over the River Trent at Keadby, and prepared generally the whole of the details in connection with the same. He is an Associate Member of the Institution of Civil Engineers, and also of the Institution of Mechanical Engineers.

* * *

PRESIDING at the annual meeting of the Great Eastern Railway, Lord Claud Hamilton, M.P., said that the employment of women had proved most satisfactory, and a thousand more had been

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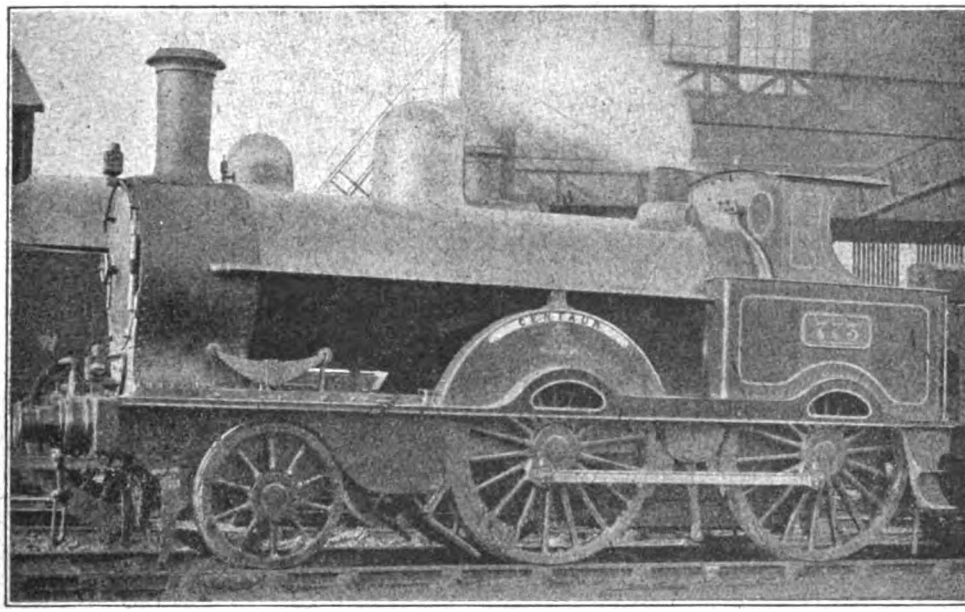

Photo] [*Chas. H. Lang.*

LONDON AND NORTH WESTERN RAILWAY.

2–4–0 locomotive, No. 773, *Centaur.*

taken on, making the total 3,600. They had opened a women's police branch.

* * * *

LORD BALFOUR OF BURLEIGH, presiding at the annual meeting of the Great Northern Railway, said that the amount paid in addition to wages in the form of bonus during the past year was £1,056,000. It was estimated that for the current year the total bonus additions for the company would amount to £1,700,000. Those additional payments by railway companies as a whole for 1918 would, so far as could be at present calculated, reach the enormous figure of £34,000,000, and more or less correspond to the present payment to the Preference and Ordinary dividends of the whole of the British railways. It was their understanding that Government control would not cease with the declaration of peace, but that an interval would be allowed to enable the position to be fully considered.

* * *

AT the Great Eastern Railway annual meeting, Lord Claud Hamilton, M.P., gave some very interesting particulars of the company's efforts as food producers and practical farmers. He remarked:—"For years the company has been growing fruit and vegetables on a piece of ground at Chigwell for consumption in the hotels. This supply of fresh vegetables has been much appreciated by the hotel management and our clients, and we have now decided to carry on this policy of providing vegetables on a much larger scale. The farm of Dodnash Priory, in extent about 480 acres, has recently been purchased by the company. The farm lies near to Bentley station, and as large supplies of manure are available from the company's stables, it is hoped very soon to have this land in a high state of cultivation. As instancing the very large demands made by our hotels in the matter of fruit and vegetables, it may be mentioned that in a normal year 300 tons of potatoes are required to meet the requirements of those who use the hotels and refreshment rooms, and no doubt is entertained that we shall be able to supply vegetables and fruit at a lower cost than we are able to buy in the open market. We shall, besides, secure the vegetables in a much fresher condition than is now possible. The farm will also prove very useful to us as a rest place for our horses, and all the horse work on the farm is being done by horses in need of rest from the wear and tear of paved and asphalted streets and ballast on the permanent way. During the summer months it is intended to send a certain number of horses down to the farm for a complete rest, and it is hoped by this means to lengthen considerably the working period of their lives. The farm buildings are admirably adapted for giving hospital treatment to horses, and contain upwards of twenty loose boxes. As this company derives a considerable revenue from the carriage of eggs and poultry in its area, and as East Anglia is very favourably situated for the development of this industry, we have decided to carry out a series of experiments in poultry culture. It is anticipated that after the war there will be large developments in the egg and poultry industry, as the keeping of poultry and production of eggs is work very suited to

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the capacity of our maimed and blinded soldiers. We are already carrying out, in conjunction with the National Utility Poultry Society, of which I have the honour to be President, an egg-laying competition at Dodnash. These competitions are very favourably regarded by the Board of Agriculture as a means of raising the egg-producing qualities of our poultry."

* * *

In December last Mr. Bowen Cooke, Chief Mechanical Engineer, announced that the London and North Western Railway would welcome suggestions for improvements of manufacture or of carrying out work which might occur to any of the company's staff and that, in the event of any such suggestion being made use of by the company and being found beneficial, a suitable acknowledgment would be made and, if desirable, assistance would be rendered towards protecting the idea by letters patent. In the latter event this would be done under the usual conditions appertaining to patents taken out by employees of the London and North Western Railway. In conformity with this decision of the directors they have recently made an award of £5 to a man who had suggested an improvement to the machine on which he had been working. Mr. Cooke's notice adds that all that a man need do at first is to send a letter to the Works Manager, explaining clearly the suggested improvement, signing the letter and giving his works number. We are informed that there has already been an unexpectedly large number of suggestions sent in, and although probably the greater portion may be considered unworthy, some may be deserving of being followed up.

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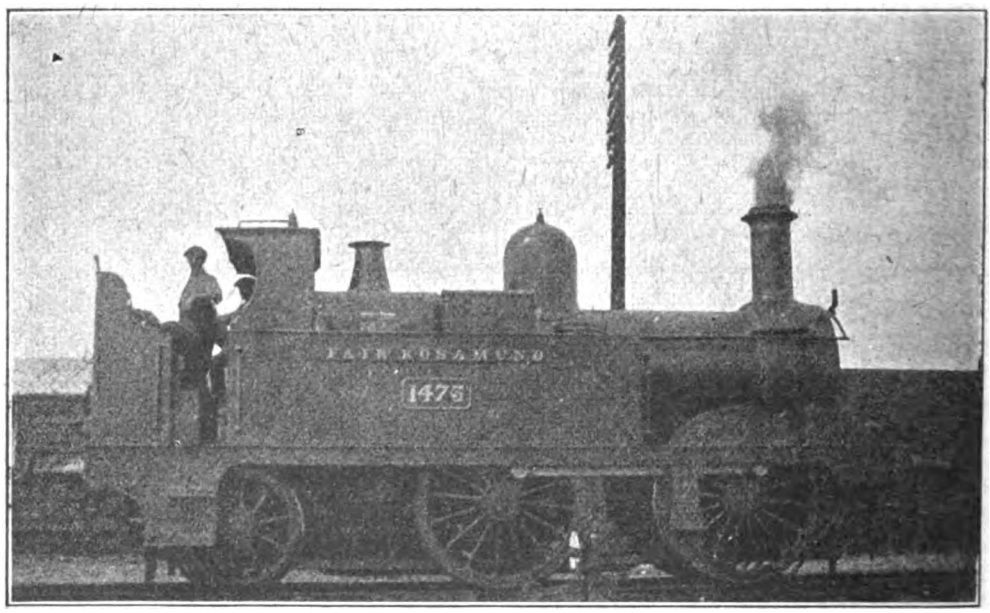
Electric light has recently been substituted for gas at Lancing, London, Brighton and South Coast Railway, the whole of the station including platforms, signal box, booking hall and other departments being illuminated by electricity. The current is supplied from the Carriage Works Power House at Lancing which is fitted with Diesel engines. The installation was made under the supervision of Mr. A. H. Panter, the Carriage and Wagon Superintendent.

* * *

From Radlett, Mr. F. H. Stingemore writes :—Your correspondent on page 141 of the January issue gives a list of engine types to be seen in the neighbourhood of Cricklewood on goods work. May I add that practically every type the Midland possesses—express and goods tender, and passenger and goods tank take turns on goods train working and shunting, only the compounds and 990's seem to be exempt? I have seen Great Northern Railway (2–4–0) and Great Eastern Railway (small 2–4–0) (0–6–0) and $\frac{2\text{–}4\text{–}2}{T}$ in the neighbourhood of Cricklewood, so with the larger Midland assortment and these, the list is actually much longer than your correspondent gives. I suppose Clapham Junction really takes the palm as having the greatest number of different companies' engines working in and out of it in these days. I have seen locomotives of all companies working into



Photo] [*A. B. MacLeod.*

GREAT WESTERN RAILWAY.

0–4–2 tank locomotive, No. 1473, *Fair Rosamund*, at Culham.

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London, there, except the Great Central and Great Eastern.

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FROM Ightham Rectory, Mr. G. R. Dewey has written:—I saw recently at Purley two 4-4-0 Great Western Railway engines of the "Bulldog" class named *Ilfracombe*, No. 3383, and *Paddington*, No. 3386. They run light from Red Hill to Purley to use the turntable there; they then return. I have also seen 2-6-0 inside cylinder engines of the Great Western Railway, also 4-4-0 London and South Western Railway 700 class, also other 4-4-0 class Great Western Railway, only I have not been able to catch their names. Three batches of two coupled together generally come every day. I have also seen a 0-6-0 Great Western Railway on a goods train from London passing Purley, also every day a 0-8-0 inside cylinder engine of the London and North Western Railway going towards Brighton, returning later.

* * *

WRITING from Mossley Hill, Liverpool, Mr. Geo. Milne remarks:—In reply to Mr. Robbins' query, the following "Prince of Wales" class engines are at present stationed at Leeds:—Nos. 173, 479, 810, 1134, 1379 and 1484. Nos. 2213 (transferred from Hull) and 233 were there until recently, but have now gone away. There are no "George the Fifths" at No. 17 shed. It is rumoured that two or three "Claughtons" are expected there shortly, but none have so far arrived, though one is now working through from Liverpool for the first time on the 10.50 a.m. *ex*-Lime Street. It is understood that no "Claughton" has previously penetrated into Yorkshire.

* * *

IN reply to Mr. J. Macartney Robbins' question concerning London and North Western Railway engines at Leeds, among many correspondents on the subject, Mr. Williams remarks: I have no record of any "George V." engines stationed at Leeds, but of the other class mentioned, "Prince of Wales," I have the following, viz.: Nos. 173 *Livingstone*, 401 *Zamiel*, 479 *Thomas B. Macaulay*, 810 *Onyx*, 1134 *Victor Hugo*, and 1379 *Witch*.

* * *

IN the February RAILWAY MAGAZINE a list of Midland locomotive sheds was given, perhaps, writes Mr. Kingsley Paton, the following list of Great Northern Railway locomotive districts may be of interest:—

No.	District.
1.	Doncaster.
2.	Peterborough.
3.	King's Cross.
4.	Colwick.
5.	Ardsley.
6.	Bradford.
7.	Grantham.
8.	Lincoln.
9.	Retford.
10.	York.
11.	Manchester.

THE same correspondent states that the 4-4-0 rebuilds of the "Bessemer" class are being provided with high-sided tenders formerly belonging to Mr. D. Earle Marsh's 0-6-0 engines Nos. 300-9. Nos. 206, 207, 209 and 210 have been so fitted. The first two of these are shedded at Battersea and the last two at Eastbourne and St. Leonards respectively. Of the new "Moguls" built last year, Nos. 342-6, all are at Battersea, except 344, which is at New Cross. No. 327, *Charles C. Macrae*, often takes the 1.40 p.m. slow Brighton to London Bridge, returning with the fast 5.0 p.m. London Bridge to Brighton.

* * *

WITH further reference to the stations of the London and North Western Railway "Claughton" locomotives, No. 2366, which until recently was at Preston, is now stationed at Rugby, its place at Preston having been filled by No. 2431, transferred from Crewe. RAILWAY MAGAZINE readers will be interested to know, writes Mr. C. C. Williams from Crewe, that engines of the "Claughton" class have recently commenced to work into Leeds. Occasionally one may be seen on the 12.30 a.m. *ex*-Crewe. For working the 10.50 a.m. and 1.25 p.m. trains *ex*-Lime Street to Leeds, a further two "Claughtons," *i.e.*, Nos. 986 and 1103, are now stationed at Edge Hill. These, it will be remembered, were the two engines referred to on page 140 of the February RAILWAY MAGAZINE as not being then in service. Of the new batch of superheater goods engines, referred to on the same page, five have already been turned out, and are stationed as follows: Crewe South (15s), Nos. 94 and 2256; Rugby (8), Nos. 2088 and 2296; Leeds (17), No. 112.

* * *

CONCERNING the London and North Western Railway inspection engine illustrated on page 93, February RAILWAY MAGAZINE, Mr. C. C. Williams, Crewe, writes that this locomotive was the original *Vampire*, and not the original *Petrel*, as described by the photographer. The latter engine is now "Engineer, Northampton."

* * *

MR. B. M. BAZLEY presided at the February meeting of the Railway Club, 92, Victoria Street, S.W. The formal business included the election of three new members, and the announcement that three other members had joined His Majesty's Forces. Mr. H. L. Hopwood (one of the first of the club members) then read his paper, "Early London Railways." This embraced a brief description of the several railways opened in London before 1865-1870 and some interesting particulars were supplied of the curious method of working the London and Blackwall Railway, by which a series of "non-stop" carriages were provided for each station. The unique working—on the reverse of the present methods of the London and Greenwich Railway was described and in the subsequent and animated debate many particulars of the early railways and train services came to light.

On March 16th a club visit will be made to Tyer's Signalling Works, Dalston.

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At the annual general meeting of the proprietors of the Glasgow and South Western Railway, the Chairman, Sir James Bell, Bart, J.P., gave eloquent testimony of the esteem in which Mr. David Cooper, the company's General Manager, is held. "I am sure," he said, "you will wish to take this your first opportunity to join with the Board in the congratulations they extended to our greatly esteemed General Manager on his completing fifty years' service with the Glasgow and South Western Railway. Mr. Cooper joined the staff of this railway in 1867, passing through various offices, in all of which he displayed ability, assiduity, and those high qualities that compelled success. Becoming Superintendent of the Line in 1884, he became General Manager in 1894, a position he has filled for 24 years with distinction and acceptance. I only indicate Mr. Cooper's career, as the press on the occasion of his jubilee gave a full account of it, dwelling on the high esteem in which he is held by every one of our staff, the general public, and the members of the Board, but our acknowledgment would be incomplete if we did not place on the records of our 1918 annual meeting the combined appreciation of the Shareholders and of the Board for fifty years' service of the highest value."

* * *

At the Furness Railway annual meeting, Mr. Frederic J. Ramsden, the company's Chairman, stated that the net income of the railway for 1917 was £280,300, compared with £277,011 for the previous year. By taking over the management of the Furness Abbey Hotel and the Furness Railway refreshment rooms from April 1st, 1917, the company had benefited by receiving a sum of about £1,300 for interest on the capital expended. The Furness Railway war bonus and war wage paid to the staff in 1917 amounted to £89,948, and the sum for 1918 would be increased. With the exception of the war bonus granted in 1915 to those coming under the Railway Conciliation Boards, to which the railways still contribute 25 per cent., the whole of this expenditure is borne by the Government. Furness Railway reserve and depreciation funds have been considerably augmented, and in the aggregate amount to £148,793, compared with £104,374 at the end of 1916. To the 1917 increase must also be added £7,492 for "Engines for renewals," which has been appropriated to reserve. For the maintenance and renewal of running lines, the reserve for future work amounts to £68,657 for 1917, compared with £32,346 for 1916. Goods and mineral traffic has been heavy. Help in engine power has been given by the London and North Western, Maryport and Carlisle and North Eastern Railways. Four good engines and tenders are now on order at Leeds, and delivery is expected shortly. Contracts have been placed at Glasgow to build four additional goods engines and tenders during the current year. To deal with the exceptional goods traffic, 348 wagons have been hired. The merchandise and mineral traffic was 5,410,039 tons for the year 1917, the largest in the records of the company, compared with 4,959,332 tons in 1916, and 4,523,661 tons in the governmental standard year 1913. Furness Railway staff to the number of 420 have joined His Majesty's forces and 116 women have been taken into the railway service. Having dealt with the developments in coal haulage, labour troubles, Mr. Ramsden gave particulars of the financial arrangements connected with the new depositing docks at Barrow, and then announced that the dividend recommended for the ordinary stock for 1917 was 2¼ per cent. and a balance of £11,091 to be carried forward. Then, remarked the Chairman, before I conclude I desire to express on behalf of my colleagues and on my own behalf our sincerest thanks to all the officers of the company, and especially to our Secretary and General Manager, Mr. Alfred Aslett, to the whole of the staff of the company for their loyal services rendered during the past year, often in adverse and difficult circumstances caused by the crisis through which the whole world is now passing. After 3½ years of this gigantic war and especially now when we are beginning to feel the pinch of it in various ways, it is inevitably with strain and tells on all of us, and the railwayman can be no exception to the general rule. As the months pass by work seems irksome and more trying to us, and it is only by hearty and cheerful co-operation that we can obtain the best result of our labours. I am fully satisfied that even after peace has been restored we can never go back to pre-war conditions, there must be more sympathy and closer relations between capital and labour, for they are in reality interdependent. It is on these lines that we must travel if we are to make the best use of what the future has in store for us. It is always rash to prophesy, but I honestly look forward to a future for our railway, on the understanding, of course, that there is complete co-operation between directors, officers and staff. This has been so in the past, and it will, I hope and believe, continue in the years to come, and thereby contribute to the successful conduct of the business of this company over which I am proud at the present moment to preside.

* * *

The Prussian Railway Department has given some information about the large number of engines and wagons built during the war. Of locomotives 4,900 had been built, an increase of 30 per cent. compared with peace times, and of wagons 120,000, also a great increase in the figures of the past. Before the end of the current financial year a further 1,700 locomotives, and 29,000 goods wagons were to be delivered. The construction of a fourth track on several lines was under contemplation, and during the whole of the war the capacity of the lines had been increased, especially in the western part of the country. It had been found necessary to reduce the passenger traffic to 55 per cent. of the peace service.

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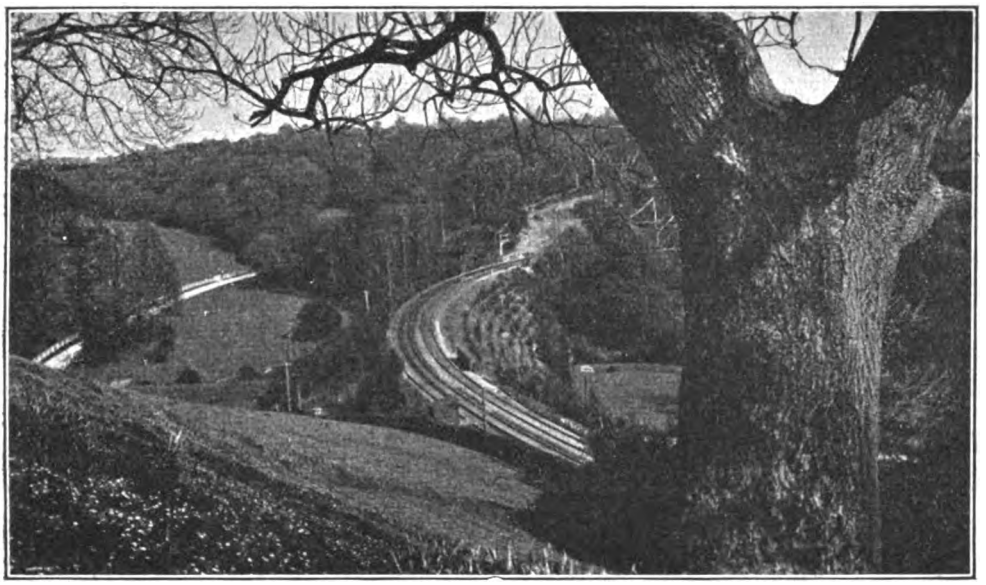

BARRY RAILWAY.
Picturesque view of the Vale of Glamorgan line through Porthkerry Park.

The Barry Railway: Its Characteristics, Engines and Traffic.

By H. L. HOPWOOD.

UNLIKE the majority of adjacent railway systems in South Wales, the Barry Railway is of comparatively modern origin, the earliest of its lines having been opened rather less than thirty years ago. Being one of the latest comers to the district, the Company has met with strenuous, but generally unsuccessful, opposition from other railways in the locality when promoting its various Bills for new lines. Thanks to the energetic policy of its management, its position as one of the principal coal carrying lines in South Wales has for some time been firmly established, and the fact that the Company declares dividends of 9½ per cent. amply testifies to the prosperity of the undertaking.

Incorporated on August 14th, 1884, as the Barry Docks and Railway, the intention of its promoters was the building of docks at Barry Island and the construction of a railway thence to the Rhondda Valley; but with subsequent extensions, the Barry Railway of to-day covers a much larger area than that included in the original scheme. Regarding the port of Barry as the heart of the system, the Barry Railway, by means of its own lines and of running powers exercised over other railways, reaches the Rhondda Valley in the north, the Rhymney Valley in the north east and the Llynvi, Ogmore and Garw Valleys in the north west, and conveys vast quantities of traffic from the coalfields of those districts for shipment at Barry Docks. It also operates a heavy passenger traffic between Barry and Cardiff, and similar, though less important, services between other centres.

The first section of the Barry Docks and Railway was opened for traffic on December 20th, 1888. This was the line from Barry to Cogan, where a junction was formed with the Penarth branch of the Taff Vale Railway. The opening of Barry Docks and of the line from Cadoxton to Trehafod Junction, on the Rhondda Valley branch of the Taff Vale Railway, took place on July 18th, 1889, whilst the extension from Barry to Barry Island was completed on August 3rd, 1896. In the meantime the railway had become known as the "Barry Railway," the word "Docks" being omitted from the original title. This alteration dated from August

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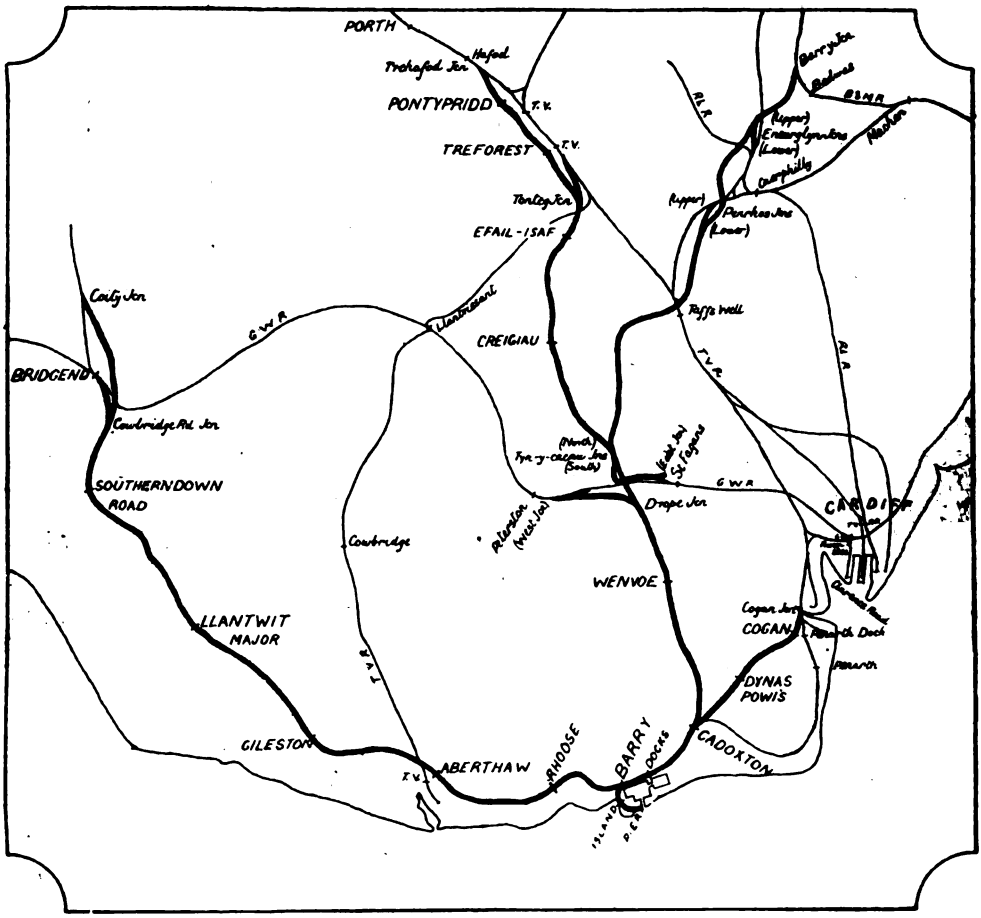
5th, 1891. The line from Barry to Coity and Bridgend, on the Great Western Railway, is the property of an independent company—the Vale of Glamorgan Railway—promoted in 1888 for the purpose of linking up Barry with the Llynvi, Ogmore and Garw Valleys coalfields, where it was estimated there were 1,500,000,000 tons of coal. Worked by the Barry Railway as part of its own system, the Vale of Glamorgan section was opened on



MAP OF BARRY RAILWAY.

December 1st, 1897. The above mentioned lines are used for both mineral and passenger traffic; in addition there is the mineral branch extending from Tyn-y-caeau North Junction to the Rhymney and Brecon and Merthyr Railways, which was opened in the first instance as far as Penrhos Junction on the Rhymney Railway (August 1st, 1901), and later to Barry Junction on the Brecon and Merthyr Railway (January 2nd, 1905).

At the present time the Barry Company owns and works 67 miles 69 chains of railway, all double line; and in addition there are more than 150 miles of sidings.

Between the Pier and Docks stations at Barry the railway describes almost a half circle, and in the area thus enclosed are the Docks, with many miles of running lines and sidings in connection; in fact the sidings extend as far as Cadoxton. Less than ¾ mile from the Island station is Barry station, serving the residential quarter of the town. Here also is situated a large engine shed. A short distance away are the workshops of the Locomotive, Carriage and Wagon Departments, these being near to Barry Docks station, where, in addition, are located in a handsome building, the administrative headquarters of the Company. The next station, Cadoxton, is an important

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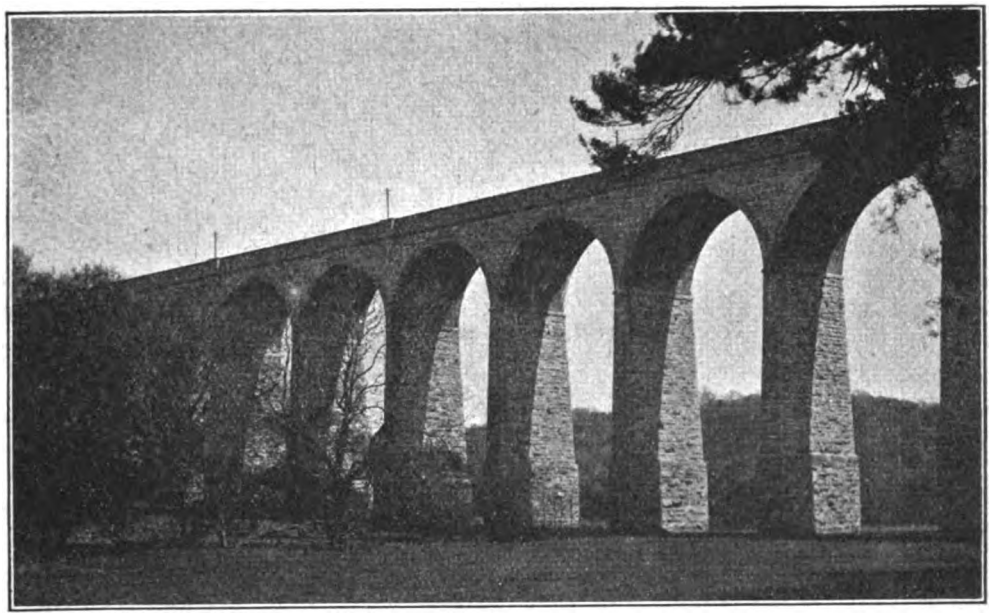
junction, with three routes diverging. The first is the Barry main line to Pontypridd and Trehafod Junction, bearing away to the north; the second is the Barry branch to Cogan; whilst the third is a branch of the Taff Vale Railway, which follows the coast line to Penarth and Cardiff. At Cadoxton there is also a direct low level line to the Docks, running down an incline and tunnelling under the sidings. By using this line, trains between the Docks and Rhondda Valley avoid passing through Barry station.

As already mentioned, the main line proceeds north from Cadoxton, and a run of 2¾ miles brings us to Wenvoe, north of



BARRY RAILWAY.
Porthkerry Viaduct, Vale of Glamorgan line.

which station is situated Wenvoe tunnel, the longest tunnel on the Barry Railway (1 mile 108 yards), and a noteworthy engineering feature of the system. A little way past the tunnel is Drope Junction, where, on the left, is a mineral branch two miles long, to the Great Western South Wales main line at Peterston. Proceeding from Drope Junction, the Barry Railway next crosses at right angles the Great Western main line, with which it again connects by a branch from St. Fagans. This branch joins the Barry main line at Tyn-y-caeau South Junction, and, almost immediately, at the North junction of the same name, the mineral line which runs to the Rhymney and Brecon and Merthyr Railways, goes off on the right in a north easterly direction. Some 3¼ miles beyond this junction on the main line is Creigiau station, which is 6 miles 5 chains north of Wenvoe—an unusually long run between stations in this district. Passing the station with the typically Welsh name of Efail-Isaf and Llantwit Fardre, and running a little over a mile, we reach Tonteg Junction, where a branch line of the Barry Railway runs down an incline to join the Taff Vale main line, which at this point runs parallel with the Barry Railway, but at a considerably lower level. A mile and a half past Tonteg Junction is Treforest station, and from here to Pontypridd, a distance of 1 mile 14 chains, the railway passes through a tunnel nearly a mile long. On leaving Pontypridd, the railway crosses some colliery lines by means of a seven span girder bridge, and shortly terminates at Trehafod Junction on the Rhondda Valley branch of the Taff Vale Railway.

Between Cadoxton and Treforest the line traverses an open and very picturesque, though sparsely populated, district; but near Treforest the character of the surroundings undergoes a great change, for

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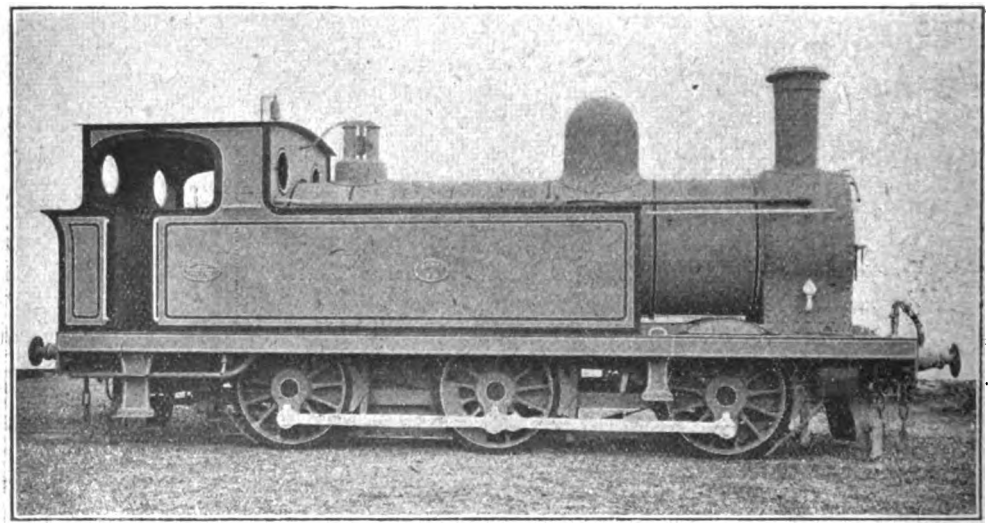
we now enter the coalfields area. The country is mountainous, and the natural beauties of the hills and valleys are now marred by the presence of chimneys of collieries and other industrial works, whilst clusters of small houses, all much alike in appearance, furnish evidence of a dense population.

Pontypridd, situated at the confluence of the Taff and Rhondda Rivers — which actually meet in the town itself—is noted for its celebrated "bridge of beauty" (Ponty-pridd) from which the town takes its name. This bridge consists of a single arch forming a perfect segment of a circle, with a chord of 140 ft. and a height from the spring to the keystone of 35 ft. It is the work of a self taught native mason, one William Edwards, who having contracted to make a bridge across the river Taff, in the year 1746 built one with three arches, but it was soon swept away by a flood. He next tried a bridge of one arch, but this also was destroyed in 1751, the weight of the abutments causing the arch to spring in the centre. In his third attempt, Edwards reduced the weight by introducing three circular openings in each side of the arch, thus securing greater stability whilst using less material. This bridge was completed in 1756 and is in use to-day, although a modern bridge erected alongside carries the bulk of the traffic.

Returning, after this digression, to Cadoxton station, the line to Cogan next calls for attention. The first station on this section is Dynas Powis, and passing this, a short tunnel is entered and Cogan station duly reached. Fifteen chains further on, at Cogan Junction, the Taff Vale line, which was left at Cadoxton, is rejoined, and Barry trains *en route* to Cardiff use Taff Vale metals as far as Penarth Curve South Junction, at which point the Great Western Railway is gained just outside the Riverside station at Cardiff.

At the west end of Barry station commences the Vale of Glamorgan section, and soon Porthkerry tunnel (537 yards) is entered. This is followed by Porthkerry viaduct, a handsome structure of 16 arches, each with a 50 ft. span. The piers are constructed of limestone, whilst the arches are of brick, the total length of the viaduct being 1,707 ft. and its height above ground 110 ft. The sea now comes into view, but is temporarily lost sight of again as the railway next runs through a 30 ft. cutting for ¾ mile. On emerging from this, the sea once more appears, and for some miles the railway follows the coast line. The first station from Barry is Rhoose, serving a quiet seaside resort which provides for an overflow of visitors to Barry Island. Next is Aberthaw, and below the Barry station is



Photo] [*Sharp, Stewart & Co.*

BARRY RAILWAY.

Fig. 1. 0–6–0 side tank engine, No. 5.

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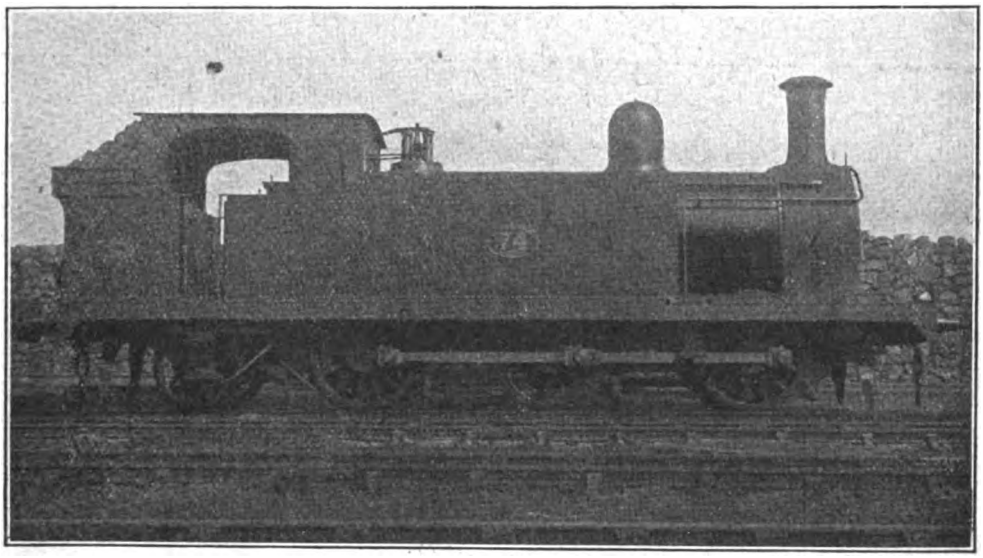
the Taff Vale station of the same name, the terminus of the latter Company's branch line from Treforest. Close to the seashore is the extensive plant of the Aberthaw Lime Works Company, a firm noted for the special quality of its lime, made from the beach pebbles. These lime works were shut down for some years, but with the opening of the railway, the industry has been started again, and is now in a very flourishing state. From Aberthaw the railway crosses the Daw Valley on an embankment over 40 ft. high, and Llantwit Major station is soon reached. For historical and archæological associations, there are few places to compare with Llantwit Major. The Romans founded a college here about the year 368 A.D., and the town still bears evidences of its former greatness and antiquity; the church, the ruined castle and the town hall, dating back to the thirteenth century. Two miles west of Llantwit occurs the summit of the Vale of Glamorgan section, 253 ft. above sea level. Here the railway runs through a cutting 2½ miles long, and then falls at 1 in 140 to Southerndown Road station. Up to this point the line has been constructed wholly in the lias, but it now enters the mountain limestone and for two miles runs through Glan Alun Dingle in deep cuttings made through the hardest rock.

We soon approach the town of Bridgend, and at Cowbridge Road Junction the railway divides, a short spur used by passenger trains going off to the left to join the Great Western main line at Bridgend station; whilst for mineral traffic the main line continues north, and after passing over the Great Western main line, terminates 1¾ miles away at Coity Junction on the Llynvi branch of the latter Company.

The mineral line which runs north east from Tyn-y-caeau Junction to join the Rhymney and Brecon and Merthyr Railways, is noted for two very fine viaducts. The Walnut Tree viaduct, which crosses the main line of the Taff Vale Railway, the river Taff and the Glamorganshire canal at Taff's Well, is a lattice girder structure of six spans, supported on five stone piers, its length being 1,548 ft. and its height 130 ft. Soon after crossing this viaduct, the Barry Railway effects junctions with the Rhymney Railway—(1) at Penrhos Junction with the Caerphilly and Walnut Tree branch, and (2) at Eneurglyn with the main line. Between these places the Barry Railway attains its highest level—382 ft. above the sea. Continuing past Eneurglyn, the Rhymney Railway main line and the Rhymney Valley are crossed by means of the Llanbradach viaduct, which ranks as the greatest engineering feature of the Barry Railway. This viaduct measures 2,400 ft. long



Photo, [*H. L. Hopwood.*

BARRY RAILWAY.

Fig. 2. 0–6–2 side tank engine, No. 74.

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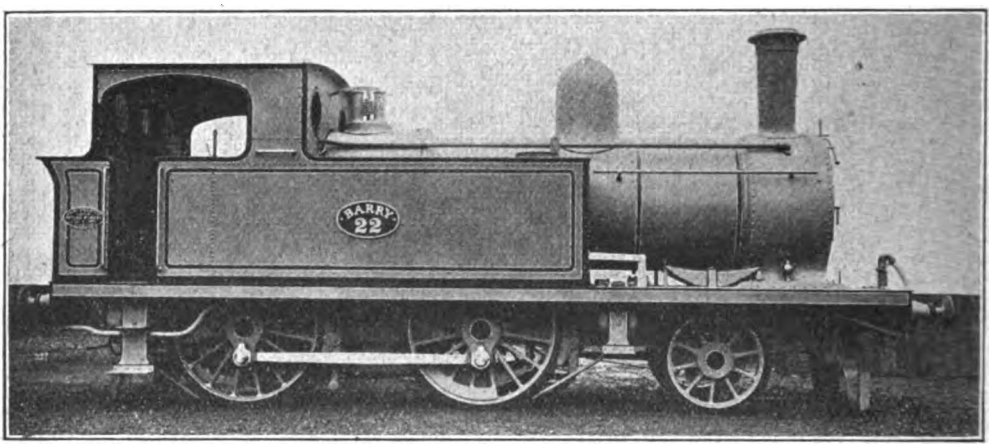
and 125 ft. high. It is of lattice girder construction, divided into eleven spans which rest on piers of blue brick. From the road in the valley below, where its immense size can best be appreciated, especially if an 80 wagon coal train is passing over at the time, this viaduct is seen to advantage. Up to this point, the Barry Railway has been confined to Glamorganshire, but on crossing the Rhymney river (which here forms the boundary between England and Wales), it penetrates the English county of Monmouth, and immediately terminates at Barry Junction on the Brecon and Merthyr Railway, between Bedwas and Maesycwmmer stations. Thus the Barry Railway's "invasion" of English territory is not at present a serious one, although it threatens to become more so in future, the Company having powers to extend the line to the Sirhowy Valley branch of the London and North Western Railway and the Western Valleys branch of the Great Western Railway.

Barry is essentially a railway made town. Before the railway's advent it was a village of about 100 inhabitants, but by 1891 (two years after the opening of the line) the population had increased to 4,722. The next ten years showed remarkable growth, the Census of 1901 recording 27,028 inhabitants, whilst to-day the population exceeds 35,000. Strangers are apt to think that the town is a port for the shipment of coal, and nothing else; but this is far from being the case. It has a large residential population, and in this respect may be considered to rank as a distant suburb of Cardiff. Barry Island (which is now an island in name only, the construction of roads and the railway having joined it to the mainland) is a seaside resort with many natural attractions, and is becoming increasingly popular, both as a residential centre and as a watering place. The town is built high up, overlooking the sea, and its climate is bracing and invigorating. To the west is Cold Knap Point, a high and rocky headland, from which one looks down upon Pebble Beach. The principal characteristic of the beach here is the line of limestone pebbles extending for more than a mile along the base of the cliffs. From the excursionist's point of view, Barry's most attractive feature is Whitmore Bay, with its magnificent stretch of sands. Another favourite resort is Porthkerry Park, with many natural beauties. Through the park runs the Vale of Glamorgan line. The town is amply supplied with railway stations, the Docks station serving the business centre, including, of course, the Docks, and Barry* station the residential quarter; whilst the Island and Pier stations are nearest to the beach.



Photo] [*Sharp, Stewart & Co.*

BARRY RAILWAY.

Fig. 3. 2-4-0 side tank engine, No. 22, as originally constructed. This engine is now running as a 2-4-2 locomotive.

* Barry station might well be renamed Barry *Town* to bring it into line with the other three Barry stations, the names of which indicate the particular locality served.

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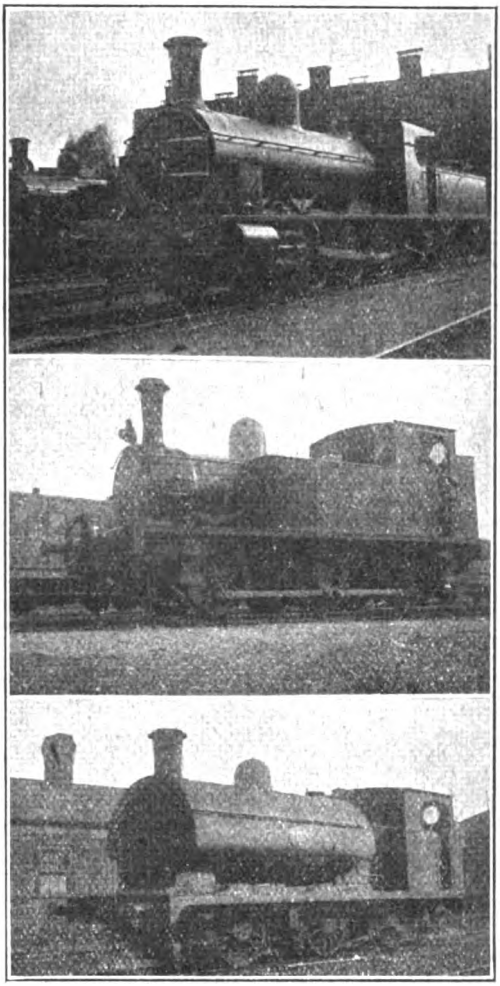
In normal times during the season, certain trains run through to the Pier station, where passengers transfer to boats which ply between various Bristol Channel resorts. Formerly the Barry Railway owned a fleet of passenger steamers that ran between Barry, Weston, Ilfracombe, etc., but a few years ago the service was given up, and now Messrs. P. and A. Campbell's (Bristol) " White Funnel Fleet " carry most of the pleasure traffic.

In the matter of station accommodation, the Barry Railway occupies a leading position among local railways, as except at one or two places, stations are provided that adequately meet modern requirements, and which, for the most part, are neat and attractive in appearance, red brick buildings with stone facings being standard practice. The largest station on the system is Barry, where there are four platform faces, the down platform being an island, whilst the up platform has a bay at the east, or Cardiff, end. At Barry Island, an ordinary two platform station, very liberal provision is made for the large volume of excursion traffic dealt with at that place. Barry Pier, a terminus, has two platforms and four roads, the two middle roads being used as sidings. Barry Docks station has one island platform with wooden buildings, and in view of the large number of passengers that use the station, it cannot be said that accommodation is generous; but we understand the question of rebuilding is under consideration. At Cadoxton, where there are four running lines, three platforms (the centre one an island) are in use, but both buildings and platforms are of wood and platform shelter is inadequate. Dynas Powis and Cogan are stations of ordinary roadside type, but at Cogan the up platform is an island, this station having been used as a terminus for passenger trains until 1893. At the present time, however, only one side of this island platform is in use.

On the main line, no passenger stations were opened until 1896, this section having previously been used for mineral traffic only. At Efail-Isaf and Treforest, four tracks are laid through the stations, the two outside loops next the platforms being reserved for passenger trains, and the two middle roads for mineral and empty wagon trains. This method of working reverses the usual practice obtaining at similar stations on other railways, where, generally, the middle roads are kept clear for express traffic; but in the case of the Barry Railway, heavy mineral trains, by keeping to the middle roads, obtain the advantage of a straight run out on restarting after a signal stop. Wenvoe, Creigiau and Pontypridd stations are of usual type, and like Efail-Isaf and Treforest, previously mentioned, are very good examples of modern practice. At Aberthaw, Llantwit Major and Southerndown Road, on the Vale of Glamorgan line,



Photos [*H. L. Hopwood.*

BARRY RAILWAY.

Fig. 4. 0–8–0 tender engine, No. 93.
Fig. 5. 0–6–0 side tank, No. 50.
Fig. 6. 0–6–0 saddle tank, No. 133.

the lay out is similar to that at Efail-Isaf and Treforest. At the Great Western station at Bridgend, Barry trains arrive at and depart from a bay at the back of the down platform.

The signals—like those of some neigh-

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bouring lines—are of somersault pattern, as first used on the Great Northern Railway, but with a slight difference from Great Northern practice, *i.e.*, *two* white stripes on the front, and *two* black stripes on the back, of the semaphore. Gradients—as they are reckoned in South Wales—are not particularly severe, the steepest being at 1 in 80.

Locomotives of the Barry Railway are 148 in number, of which only four are tender engines, the remainder being of the tank variety. As regards wheel arrangement, the stock is classified as under :—

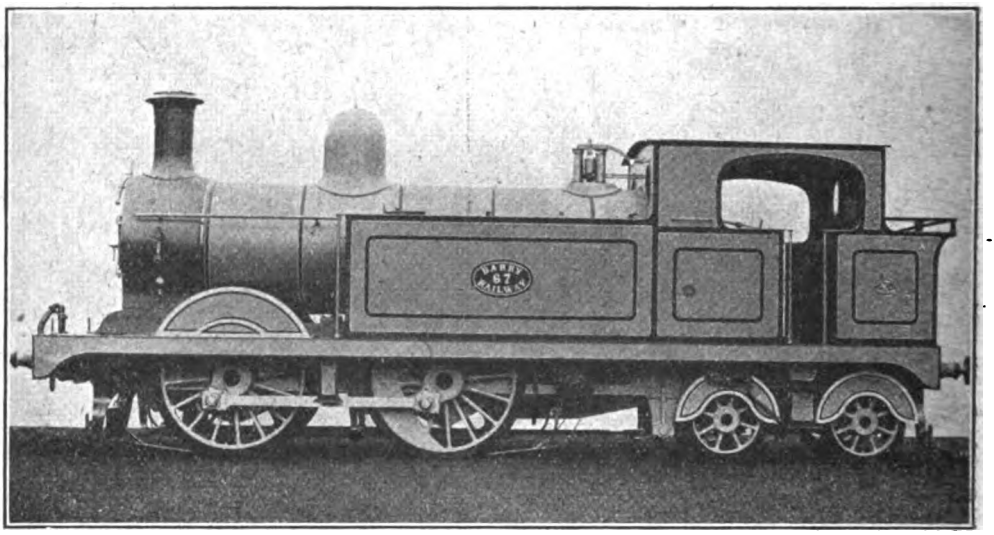
Tender Engines.	
0-8-0	4

Tank Engines.	
0-6-2	72
0-6-0	38
2-4-2	13
0-6-4	10
0-8-2	7
0-4-4	4
Total	148

Although all four of the tender engines are similar, the tank engines are sub-divided into various classes, there being two of 0-6-2 design, three of 0-6-0 and two of 2-4-2. In all, there are eleven different classes at work.

The first engines were delivered in 1888 and consisted of five 0-6-0 side tanks, Nos. 1 to 5, built by Sharp, Stewart and Co. (works Nos. 3,449-53). Cylinders are 18 in. by 26 in. and wheels 4 ft. 3 in. in diameter. (See fig. 1.) The same makers also commenced delivery in 1888 of several 0-6-2 side tank engines (fig. 2), and subsequently other makers built further engines to the same design, there being now 67 of this class at work, numbered and dated as under :—

Nos.	Makers.	Makers' Nos.	Date.
6–20	Sharp, Stewart & Co.	3,454–68	1888–9
23–32	,, ,, ,,	3,571–80	1889–90
38–46	,, ,, ,,	3,598–3,606	1890
54–63	Vulcan Foundry	1,336–45	1892



Photo] [*Vulcan Foundry Co.*

BARRY RAILWAY.

Fig. 7. 0–4–4 side tank engine, No. 67.

73–78	Sharp, Stewart & Co.	4,044–49	1894
105–116	,, ,, ,,	4,607–18	1900
122–126	Franco-Belge Co.	1,272–76	1900

This class has cylinders 18 in. by 26 in. and coupled wheels 4 ft. 3 in. in diameter. The last five engines were built by the Franco-Belge Co., of La Croyère, a Belgian firm of locomotive builders. This occurred at a period when the demand for engines on the part of railway companies was greater than British firms could cope with, and several companies, the Barry among them, had to place their orders abroad. At the same time as the Franco-Belge engines were delivered, the Barry Railway obtained five others from America, and these will be described in due course.

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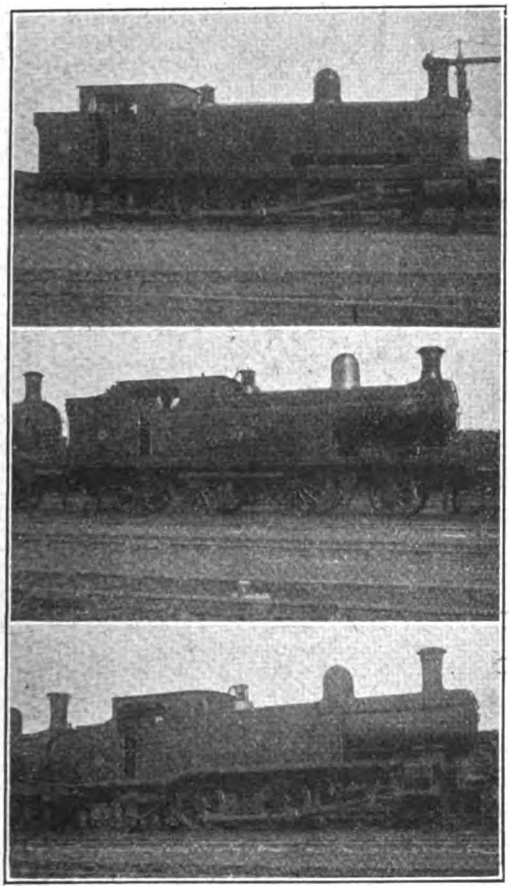
For passenger service, Messrs. Sharp, Stewart and Co. built four 2–4–0 side tank engines (fig. 3) in 1889–90, Nos. 21, 22, 37 and 52, the builders' Nos. being 3,528, 3,529, 3,610 and 3,626 respectively. Nos. 37 and 52 were afterwards sold to the Port Talbot Railway, and their numbers were taken by two new 0–6–0 saddle tanks; whilst Nos. 21 and 22 were altered to 2–4–2 engines.



Photos] [*H. L. Hopwood.*

BARRY RAILWAY.

Fig. 8. 0–8–2 side tank engine, No. 79.
Fig. 9. 2–4–2 side tank engine, No. 88.
Fig. 10. 0–6–2 side tank engine, No. 117.

This class has cylinders 17 in. by 24 in. and 5 ft. 3 in. coupled wheels.

Two further engines, Nos. 35 and 36, were purchased in 1889. They were of the 0–8–0 type with outside cylinders and four-wheeled tenders, and formed two of a large number built in 1887 and 1888 by Sharp, Stewart and Co., and intended for the Swedish and Norwegian Railway. For some reason, however, they did not go out there, two being sold to the Barry Railway, as already stated, and others to the Palatinate and Baden State Railways of Germany. In 1897 the latter railway sold two of theirs to the Barry Railway, making four in all of this class now running on the Barry line. They are numbered as follows:—

Nos.	Makers' Nos.	Date Built.	Date Purchased.
35 & 36	3,446–47	1888	1889
92	3,365	1887	1897
93	3,394	1887	1897

No. 93 is illustrated in Fig. 4.

The small 0–6–0 side tank engine illustrated in fig. 5 forms one of a class of five built by Hudswell, Clarke and Co. in 1890–1. They are chiefly used for shunting duties at Barry, and have coupled wheels of 3 ft. 6½ in. diameter, with cylinders 14 in. by 20 in. For a short time during 1909, No. 33 had the trailing coupling rods removed, and was put to work on an "auto-train," but the experiment was abandoned after a short trial and the engine is again running in its original state. This class consists of the following:—

Nos.	Makers' Nos.	Date.
33 & 34	331–2	1890
50 & 51	343–4	1890
53	352	1891

The 0–6–0 saddle tanks (fig. 6), of which there are now 28 in service, were introduced in 1890. Cylinders are 18 in. by 26 in., and coupled wheels 4 ft. 3 in. in diameter. These engines are numbered, and were built, as follows:—

Nos.	Makers.	Makers' Nos.	Date.
47–49	Sharp, Stewart & Co.	3,607–9	1890
64 & 65	Vulcan Foundry	1,346–7	1892
70–72	Sharp, Stewart & Co.	4,050–2	1894
37 & 52	,, ,, ,,	4,593–4	1900
99–104	,, ,, ,,	4,595–4,600	1900
127–132	N.B. Locomotive Co.	16,628–33	1905
133–138	Hudswell, Clarke & Co.	712–7	1905

Nos. 37 and 52 took the numbers of the 2–4–0 engines sold to the Port Talbot Railway, as previously mentioned.

In 1892 two very fine 0–4–4 passenger side tank engines came from the works of the Vulcan Foundry, and in 1895 two similar engines were built by Sharp, Stewart and Co. (fig. 7). They have cylinders 18 in. by 26 in. and wheels 5 ft. 7½ in. in diameter, and bear the following numbers:—

Nos.	Makers.	Makers' Nos.	Date.
66 & 67	Vulcan Foundry	1,348–9	1892
68 & 69	Sharp, Stewart & Co.	4,053–4	1895

Messrs. Sharp, Stewart and Co. delivered

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seven 0-8-2 side tank engines in 1896, Nos. 79 to 85 (works Nos. 4,182-8). They are illustrated in fig. 8, and were the first ten wheeled, eight-coupled engines to be put to work in this country. They are very powerful machines, having cylinders (outside) 20 in. by 26 in., eight-coupled wheels 4 ft. 3 in. in diameter and an adhesive weight of 62 tons 18 cwts.

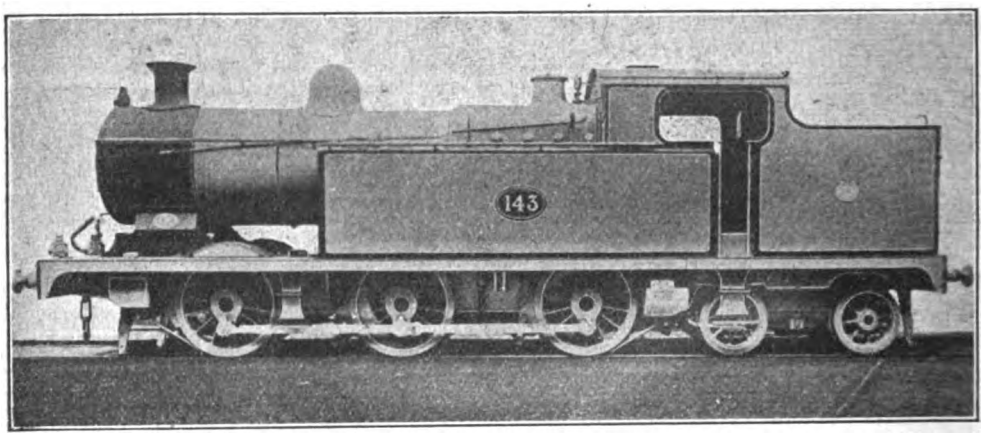
These engines were followed in 1897 by some very handsome 2-4-2 side tanks. They are now the standard type for passenger service, and have 18 in. by 26 in. cylinders and 5 ft. 7½ in. coupled wheels. One of them is shown in Fig. 9, the list of the class being as under:—

Nos.	Makers.	Makers' Nos.	Date.
86-88	Hudswell, Clarke & Co.	473-5	1897
89-91	Sharp, Stewart & Co.	4,367-9	1898
94-98	,, ,, ,,	4,497-4,501	1899

The American built engines, previously referred to, were delivered in 1900 from the works of the Cooke Locomotive Co., of Paterson, N.J., U.S.A. They are numbered 117 to 121, and are 0-6-2 side tank engines with outside cylinders (see Fig. 10). They have bar frames extending to the firebox, where they are bolted to slab frames. The outside cylinders (18 in. by 24 in.) have the steam chests arranged above, the slide valves being driven by rocking shafts. Coupled wheels are 4 ft. 3 in. in diameter.

The latest engines (fig. 11) were built in 1914 by Hawthorn, Leslie and Co., and consist of a class of ten 0-6-4 side tanks numbered 139 to 148 (makers' Nos. 3038-47). These engines have very large coal and water capacities, viz., 4 tons and 2,200 gallons respectively. Cylinders are 18½ in. by 26 in. and coupled wheels 4 ft. 7 in. in diameter, whilst the total weight is 78¾ tons. Further dimensions of these, and of all other, engines are included in the table on page 225.

Passenger carriages, of which there are 136, are four, six or eight wheeled, some of the four wheelers having recently been purchased from the Lancashire and Yorkshire Railway. The interiors of workmen's coaches are not upholstered, the seats and backs being formed of battens with a space between each. By adopting seats of this description, dust and dirt are prevented from accumulating. Both engines and carriages are painted lake colour, passenger engines being lined out with black bands, having yellow and vermilion edging. Passenger engines also have brass dome covers, brass safety valve bases and copper topped chimneys, but such refinements are lacking in the mineral engines, which are also less elaborately lined out. All engines have their numbers shown on the chimneys in brass figures, except Nos. 139 to 148, which have white metal figures fixed on the smokebox doors.



Photo] [*Locomotive Publishing Co., Ltd.*

BARRY RAILWAY.

Fig. 11. 0-6-4 tank engine, No. 143.

Although the Barry Railway is chiefly important as a coal carrying line, its passenger traffic is also considerable. There are four distinct passenger services, operating between the following centres, viz., (1) Barry and Cardiff, (2) Cardiff and Pontypridd, (3) Barry and Bridgend, and (4) Barry and Porth. As regards the Barry-

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Cardiff service, it was not until August, 1893, that it was fully established, as previously, trains ran only between Barry and Cogan, passengers changing at the latter station and going forward to Cardiff in Taff Vale trains from Penarth Dock station, which is adjacent to Cogan. At Cardiff, both Barry and Taff Vale trains now use the Riverside and Clarence Road stations of the Great Western Railway. Previous to 1893 this Great Western branch was used only by mineral trains, but the two stations mentioned were then erected for the use of Barry and Taff Vale trains.

Passenger traffic between Barry and Cardiff is heavy at all times of the day, but especially so during the "rush" hours, as many Cardiff business men make their homes at Barry and travel to and fro daily. In pre-war days the service consisted of 32 trains between Barry and Cardiff, of which 17 started from Barry Island and the same number (but not necessarily the same trains) went through to Clarence Road, the remainder running only between Barry and Riverside stations. The first train was at 4.57 a.m. and the last at 11.35 p.m., and, with one or two exceptions, they served all intermediate stations. The 9.39 a.m. *ex*-Barry was a through train to Newcastle-on-Tyne and was worked by a Barry engine as far as Cardiff, the coaches being provided by the Great Western and Great Central Railways on alternate days. Between Cardiff and Barry there were 30 trains—the first at 5.39 a.m. and the last at 12.12 midnight. Of these, 15 started at Clarence Road and 17 went through to Barry Island, and practically all of them stopped at intermediate stations. A notable exception, however, was the 9.32 a.m. from Clarence Road, which ran without a stop between Riverside and Barry Docks. The train from Newcastle to Barry left Cardiff at 7 p.m., but this, and the corresponding morning train from Barry, have, since January 1st, 1917, been suspended owing to the war.

Between Cardiff and Pontypridd there are normally 11 stopping trains, and ten in the opposite direction. This service, inaugurated in June, 1896, is (or was, previous to the war), competitive with that of the Taff Vale Railway. Barry trains *en route* to Pontypridd travel over the Great Western main line to St. Fagans, and 9 chains west of that station reach a branch of their own line. At this point (St. Fagans East Junction) the Barry Railway leaves the Great Western Railway on the right hand side and runs parallel with it for a short distance, then passes under the Barry main line and joins the latter at Tyn-y-caeau South Junction by means of a stiffly graded curve.

On the Vale of Glamorgan section there

BARRY RAILWAY ENGINES. TABLE OF DIMENSIONS.

Type	0-6-0 side tank	0-6-2 side tank	2-4-2* side tank	0-8-0 tender	0-6-0 side tank	0-6-0 saddle tank
Number in class	5	67	2	4	5	28
Illustrated by fig.	1	2	3	4	5	6
Cylinders (in.)	18 × 26	18 × 26	17 × 24	20 × 26	14 × 20	18 × 26
Wheels, coupled (ft. and in.)	4.3	4.3	5.3	4.3	3.6½	4.3
Wheels, L.T. or bogie (ft. and in.)	nil	3.6	3.6	nil	nil	nil
Heating surface (sq. ft.)	1,126	1,070	1,041	1,410	562	1,070
Boiler pressure (lbs.)	150	150	150	150	140	150
Grate area (sq. ft.)	20·4	20·5	14·5	22·25	9	20·5
Tank capacity (gals.)	1,000	1,630	800	1,800	660	1,050
Total weight (tons and cwts.)	45.6	57.0	41.4	48.18	28.19	49.10

Type	0-4-4 side tank	0-8-2 side tank	2-4-2 side tank	0-6-2 side tank	0-6-4 side tank
Number in class	4	7	11	5	10
Illustrated by fig.	7	8	9	10	11
Cylinders (in.)	18 × 26	20 × 26	18 × 26	18 × 24	18½ × 26
Wheels, coupled (ft. and in.)	5.7½	4.3	5.7½	4.3	4.7
Wheels, L.T. or bogie (ft. and in.)	3.0	3.6	3.6	3.6	3.1
Heating surface (sq. ft.)	1,126	1,476	1,070	1,147	1,495·5
Boiler pressure (lbs.)	150	150	150	160	180
Grate area (sq. ft.)	20·25	22·75	20·5	21	22
Tank capacity (gals.)	1,400	2,100	1,600	1,600	2,200
Total weight (tons and cwts.)	47.17	74.16	60.18	56.5	78.15

* These dimensions apply to the engines when originally built as 2-4-0 tanks.

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were 7 trains from Barry to Bridgend, and 6 in the opposite direction, with 4 additional ones each way between Barry and Llantwit Major. Passenger trains on the main line from Barry run as far as Porth, the second station on the Rhondda Valley branch of the Taff Vale Railway; and, before the war, there were 6 trains which made this journey to and from Barry. It will be seen that main line stations from Creigiau to Pontypridd inclusive are served by both Barry-Porth and Cardiff-Pontypridd trains, the normal total at those stations being 17 up and 16 down.

It should be noted that the lines *from* Barry are designated "up" and those in the opposite direction, "down." This method of distinguishing running lines (which is contrary to general practice) is the one adopted by most local railways, and to an extent indicates the direction of the gradient, *i.e.*, the *up* lines *ascend* from the coast to the coalfields. From the standpoint of economy of engine power, it is a fortunate circumstance that loaded coal trains from the collieries to the ports have falling gradients in their favour.

As a fitting conclusion to this review of the Barry Railway, the following traffic statistics, relating to the year 1913 (the most recent date available), are given :—

Number of passengers	3,292,749
,, ,, season tickets	1,597
Tonnage conveyed—	Tons.
Coal	11,220,098
Other minerals	116,572
General merchandise	731,098
Total	12,067,768

SPECIAL NOTICE.

OWING to the further drastic restrictions made by His Majesty's Government, through the Paper Commission, in regard to the quantity of paper used by publishers, it is necessary to reduce the number of magazines printed to the lowest possible level compatible with the demand, and the only readers, other than direct subscribers, who can expect to be supplied are those who place definite orders with a newsagent or a bookstall manager.

Coupled with the reduction of the quantity of paper comes another serious increase in the cost of production. Printing and paper prices, as well as other expenses, have soared high above pre-war figures. These circumstances compel a further advance in the price of the RAILWAY MAGAZINE, so that commencing with the forthcoming May number each monthly copy will be sold at One Shilling net.

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Railway Photography.

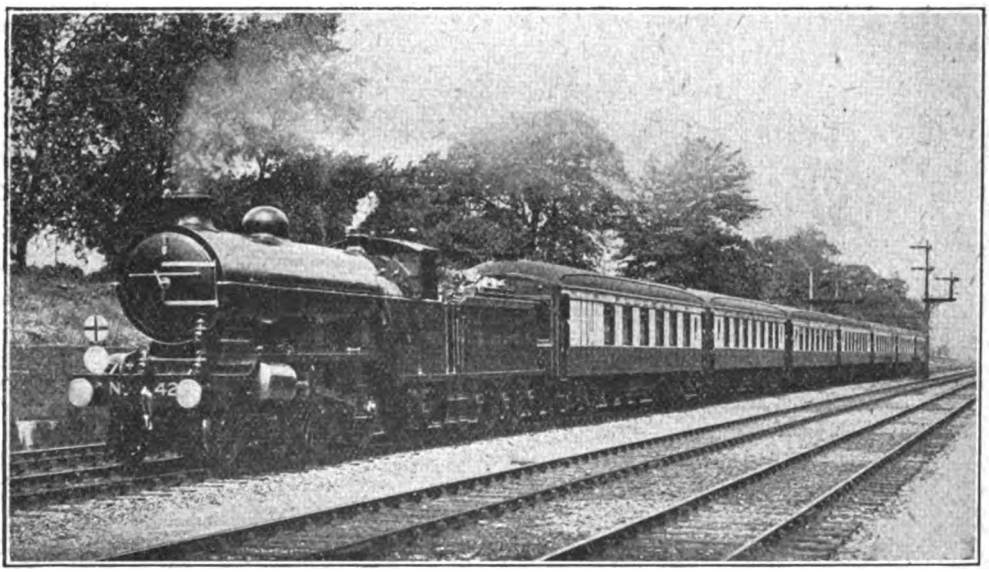
By F. E. MACKAY.

WITH the advent of the season, it will not be out of place to deal with the subject of railway photography for the benefit of those readers who use their apparatus for the purpose of photographing express trains in non-military areas.*

It is not intended to deal exhaustively with the subject, as it would be impossible to do so in the space allotted to me, but I will endeavour to point out, shortly, the best methods to employ in order to obtain good results.

A lens with an aperture of not less than F.6 and a focal plane shutter are essential for the best work. There are many lenses on the market with apertures of F4.5, but such a large aperture is not necessary when working in a good light, it can only be used as a reserve power in case of dull weather, when possibly some special photograph must be taken. With such an aperture the most careful focussing is called for or poor pictures will result. An excellent lens working at F.6 will be found in the Aldis, which gives splendid definition, and its price is quite moderate. This lens should perform all that the average railway photographer requires.

A focal plane shutter is essential when photographing trains which are travelling at very high speeds. It gives better results than any other shutter owing to the fact that higher speeds are obtainable with it, and as regards exposure better exposed negatives can be secured, as this shutter works close to the plate and allows the maximum of light passing through the lens to reach the plate. Distortion is a fault which may occasionally be met with in photographs taken with the focal plane shutter, more especially in trains



Photo] [*F. E. Mackay.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.
"The Southern Belle."

* The RAILWAY MAGAZINE does not undertake the provision of information as to where photographs may or may not be taken during the war.

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moving at high speeds. This is caused through the shutter exposing the plate in sections, but if a wide blind aperture, combined with a high spring tension be used, distortion will seldom be noticed.

The question of shutter speeds is one which troubles many photographers. There are some who use the shutter at one constant speed, regardless of the speed at which a train is travelling. This is a great mistake, for it is obvious that a train ascending a heavy bank, such as Shap, cannot require as high a shutter speed as that necessary for a train travelling in the reverse direction.

A useful table of distances at which to photograph trains travelling at different speeds with the marked speeds of the shutter can be worked out from the following :—

Multiply the number of feet per second at which the train is travelling by 100 times the focal length of the lens and divide the result by the speed of the shutter. Thus a train travelling at 60 miles an hour moves at the rate of 88 feet per second, focus of lens 6 inches, shutter speed 1/500th of a second.

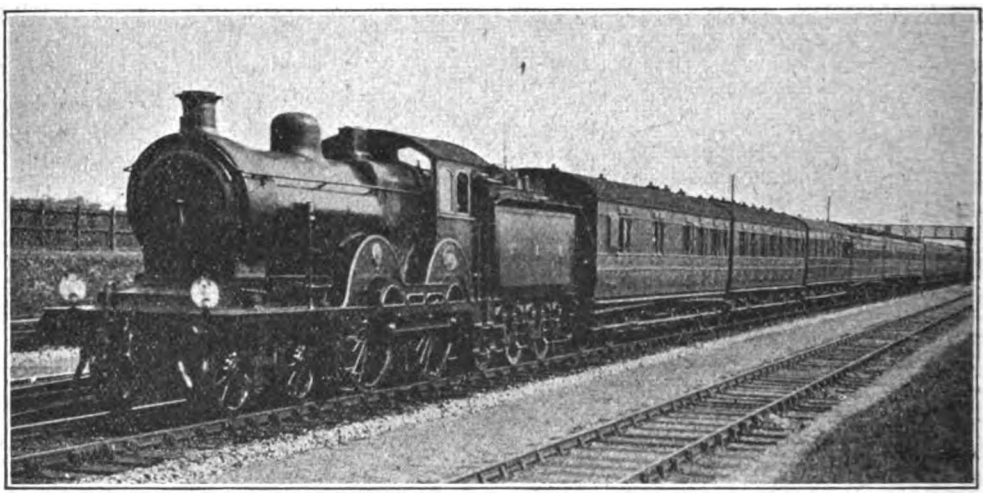
$88 \times 600 \div 500 = 106$ feet (approximately).

This gives the distance at which the train should be photographed when travelling at right angles to the line of sight; if moving at an angle of about 45°, this result may be halved.

Mr. C. J. Allen's articles on "British Locomotive Practice and Performance" will prove useful in connection with the above table, as it is possible to find out the average speeds of trains at almost any place on any railway.

Those who already have apparatus which is not fitted with a focal plane shutter can increase the speed of an ordinary roller blind shutter by obtaining a piece of shutter blind material and cutting in it an aperture about half the size of the existing shutter blind aperture. This should be carefully glued over the shutter blind, and will double the speed of the shutter. It is needless to say that if this is done the full blind aperture will not be available for focussing purposes.

The fastest plates should be used for focal plane work, and great care must be exercised in developing, as the modern ultra rapid plates will fog when too much red light is allowed to shine on them. If orthochromatic plates are used, even more care must be exercised, and they should be covered over during development. As regards plate speeds, too much attention should not be given to the luring speed numbers printed on plate boxes. Almost every manufacturer claims that his ultra rapid brand is "the fastest plate in the world," but as different methods are employed by makers in arriving at plate speeds, it is quite possible that one "make" marked 500 H. & D. may be no faster than another "make' marked 400 H. & D. The best advice is to find a suitable plate and always use that kind. During the



Photo] [*F. E. Mackay.*

GREAT EASTERN RAILWAY.

Up Cromer Express near Chadwell Heath.

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past 10 years I have tried all "the fastest plates in the world," and have found some very far from satisfactory. Good examples of fast plates are to be found in Imperial "Flashlight," Gem "Salon," and Marion "Record."

From long experience I have found the finest developer for high speed work to be Amidol. It is both suitable for plates, bromide and gaslight papers. The best formula for plates will be found to be: Amidol 50 grains, soda sulphite 1½ ozs., water 20 ozs. For plate work no bromide of potassium should be added, but if used for bromide and gaslight papers, 10 grains of bromide of potassium should be added to the above solution. With this developer the image rushes up quickly, giving the impression that the plate has been over-exposed. Development should, however, be continued for 4 or 5 minutes to obtain sufficient density, after which it should be rinsed in water and fixed, for preference, in an acid fixing bath.

Photographs taken against the sun, or where the sun does not shine on the side of the train, should be developed in a dilute solution to avoid a harsh result.

"The Southern Belle," which is reproduced, is an example of a photograph in which the sun was shining direct on the front of the engine. It will be noticed that by careful development in a dilute solution the wheels (in shadow) are brought out clearly.

As Amidol does not keep well in solution, only a sufficient quantity for the work in hand should be made up.

Photographs intended for reproduction are best printed on bromide paper. With this process it is possible to obtain brilliant pictures, and, further, where a negative has a good smoke effect (which would probably be lost in printing on P.O.P.), it can, by shading the negative with a piece of cardboard during exposure to gaslight or other illuminant, be brought out with great advantage. The card must be kept moving slightly during the period of exposure, otherwise a clear cut line will show.

The Amidol developer above mentioned can be used for bromide prints and gives fine results.

Dealing with bromide papers, I may mention that Illingworth's "Press" Bromide Paper will be found an excellent medium for printing from train negatives. It is made in three grades to suit all classes of negatives, and for this work I have found the "Soft" grade suitable, though some may prefer the "Medium" grade. It has a further advantage that it is free from stress or "pencil" markings which sometimes appear on bromide papers.

Little need be said in regard to the best position from which to photograph trains. It is generally recognised that the best position is that on the inner side of a curve, failing which a straight stretch of line should be chosen. Photographs taken from a position on the outer side of a curve are rarely a success, as only the engine and a few coaches are shown.

The side of the train lighted by the sun should be photographed, but if for various reasons this cannot be done, it will be possible to obtain a good photograph of the side in shadow if care is taken in development and a dilute solution used, also the lens should be shielded from direct sunshine if the position chosen makes it essential to face the sun.

"What stop should be used?" is a question frequently asked; but it is so dependent on the weather conditions that the best advice I can give is to urge the purchase of an exposure meter which will show at a glance which is the best stop to use.

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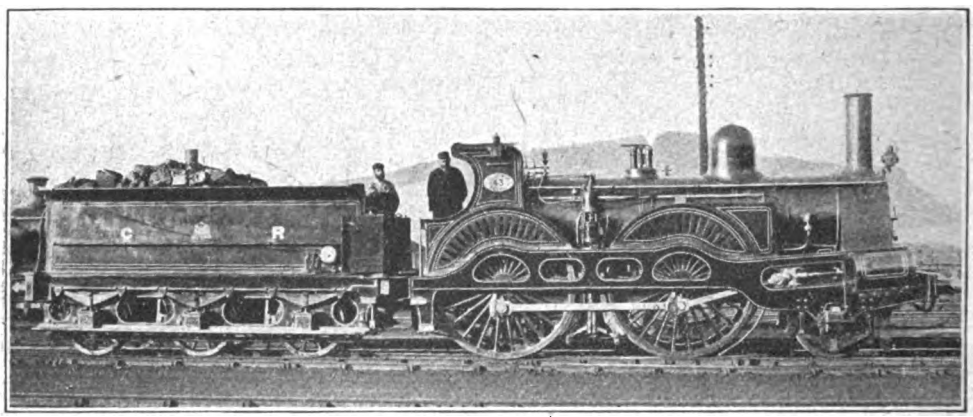
Locomotive and Train Working in the latter part of the 19th Century.

CALEDONIAN RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN 1865 the amalgamations which gave the Caledonian a through line of its own from Carlisle to Aberdeen took place. Originally the Caledonian main line took the form of a Y of which the left hand arm branched off at Carstairs to Glasgow and Greenock, and the right hand arm to Edinburgh with a line to Greenhill about 4 miles from Falkirk, where it joined the Scottish Central Railway. Access to Perth was obtained by amalgamating with the Scottish Central, and thence to Aberdeen by taking over at the same time the various lines of the Scottish North Eastern Railway. Those readers interested in the development of the Caledonian should refer to "The Caledonian Railway's Diamond Jubilee Number" of the RAILWAY MAGAZINE, September, 1907.



NO. 43 (SERIES 42–48) 2–4–0 EXPRESS ENGINE (B. CONNOR).
Built by Dübs & Co., 1874. Wheels, 7 ft. 2 in. Cylinders, 17½ in. by 24 in.

The coupled express engines were usually employed on three sections of the line, *viz.*: (1) Edinburgh to Glasgow and the West Coast, (2) Perth and Aberdeen, and (3) Dundee, Perth and Glasgow (Buchanan Street), but in addition the Perth engines had one through run to Carlisle. The greater number of the coupled engines had 7 ft. 2 in. wheels, but eleven of them had smaller 6 ft. 8 in. wheels. They were all, with the exception of five bogie engines, of similar type and of Mr. Connor's design, and retained the leading features of the old Allan Crewe patterns.

The eleven 6 ft. 8 in. engines had 17 in. by 24 in. cylinders, but the boilers were small and had a total heating surface varying in different engines, but averaging not more than 900 sq. ft. These engines were Nos. 92 to 97 and 103 to 107, and came out from St. Rollox works in 1865–8. The more numerous class consisted of those with 7 ft. 2 in. wheels as under :—

			Cylinders.
98 to 102	St. Rollox Works	1867	17 in. by 24 in.
107 to 112	St. Rollox Works	1868	17 in. by 24 in.
117 to 122	Neilson & Co.	1868	17 in. by 24 in.
123 and 124	Perth Works	1869	17 in. by 22 in.
30 to 41	Neilson & Co.	1872–3	17 in. by 24 in.
42 to 48	Dübs & Co.	1874	17½ in. by 24 in.

Like those of the 6 ft. 8 in. coupled engines the boilers were very small. Those

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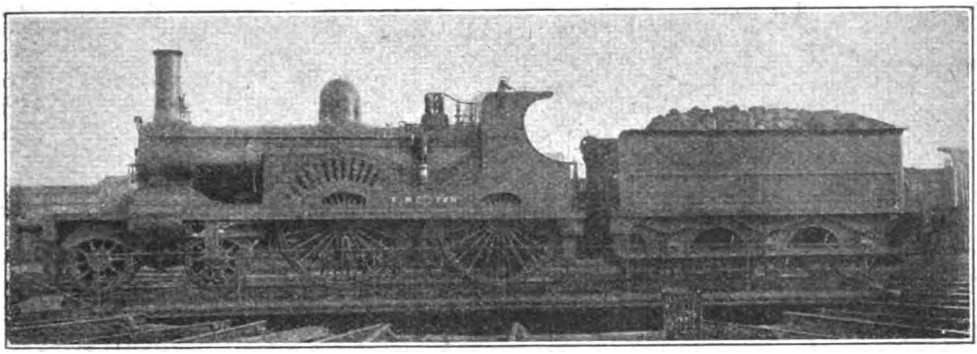

4–4–0 EXPRESS ENGINE (SERIES 125 TO 129).
Designed by Mr. Connor. Built by Neilson & Co., 1877.
Wheels, 7 ft. 2 in. Cylinders, 18 in. by 24 in.

of Nos. 42 to 48 had only 781 sq. ft. of heating surface, of which the firebox supplied 82·3 sq. ft. The weight of these engines was 36 tons 13 cwt. No. 43 was subsequently rebuilt by Mr. Brittain with a somewhat larger boiler, but this provided only 955½ sq. ft.

There were in addition five handsome 4–4–0 express engines with outside cylinders 18 in. by 24 in., 7 ft. 2 in. coupled wheels, and 140 lbs. pressure, designed by Mr. Connor but built in Mr. Brittain's time by Neilson and Co. in 1877. These had a total heating surface of 987¼ sq. ft., towards which the firebox contributed 82 sq. ft. only, and the engines weighed 42 tons in working order.

Although of course changes were made from time to time in their stations the following were their usual quarters in 1880–3. Of the 6 ft. 8 in. engines, 93, 94, 96, 97 and 104 were at Edinburgh on the Glasgow services *viâ* Midcalder. Nos. 92, 95, 103, 105 and 106 were on the Wemyss Bay services and Coast trains. The 7 ft. 2 in. engines 98 to 102, and 108 to 112, were all at Glasgow and worked to Edinburgh and also on the Coast trains. These also ran to Perth and Dundee. Nos. 117 to 122 and some of 30 to 41 were quartered at Perth, and worked to Glasgow, Carlisle, Dundee and Aberdeen. The remainder of the 30–41 series were at Aberdeen. The last series with 17½ in. cylinders, Nos. 42 to 48, were at one time at Edinburgh, but appear to have been changed over to the Coast, where 43 was quartered at Ayr, and 44 to 48 at Greenock. 43 used to work a through train between Ayr and Edinburgh. The two remaining engines, Nos. 123 and 124, which had been constructed at the old Scottish Central works at Perth,* were, I believe, retained in that district, but they do not appear to have been used much on the more important trains. No. 124 for some years worked between Perth and Crieff *viâ* Methven Junction.

Dealing now with the main line trains, the most important were the "Limited Mails," the timing of which in 1876–7 between Carlisle and Edinburgh I have already mentioned. The down "Limited" was the old 8.50 p.m. from Euston, and carried first and second class passengers only. The omission of third class passengers was perhaps excusable, for this was in the first place a post office train, with a rigid time-keeping schedule, and passengers were only of secondary importance. Any delay to the mail was a thing to be avoided, and entailed a vast correspondence with the Post Office. Now correspondence of this sort was something not to be entered upon lightly; it had a way of growing like a snowball, and continued interminably, so that after many months it partook of the nature of "Johnnie Walker, still going strong." Therefore the "Limited" did its best to go as strong as the Scotch whisky, and avoid government complications, and unlike the other north-bound expresses it omitted the stop at Beattock by taking a pilot engine right through from Carlisle to

* The two engines 123 and 124 were really of Scottish North Eastern design, and in hand at Arbroath works when the Caledonian Railway took over this line. The parts were eventually sent to Perth and put together there in 1869. They had domes on the fireboxes, and Allan spring balance safety valves on the boiler barrels, with cabs of the old Highland Railway pattern.

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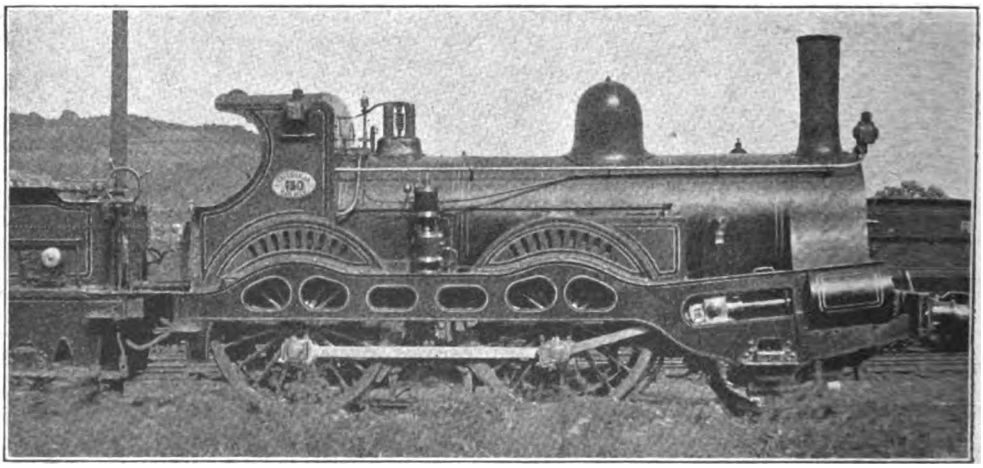
the summit, but made a stop at this point to detach it. In 1883 it was allowed 1 hour 35 min. to Carstairs (73½ miles), but the actual running average allowing for the stop for setting down the pilot engine was 48½ m.p.h. This was, however, not the fastest booked run on the Caledonian, although at that time the longest, for the down day Scotch express ran from Carlisle to Beattock, 39¾ miles in 48 min., a speed of 49¾ m.p.h. But the intermediate times of the "Limited" were very good. It was booked from Carlisle to the summit of the Beattock bank in 66 min. (49½ miles), of which the last 10 miles up the 1 in 80 and 1 in 75 were allowed 22 min. As the train was due to pass Beattock station at 5.2 a.m., this meant that the 39¾ miles from Carlisle had to be run in 44 min. from the start—a speed of 54·1 m.p.h., some of it on a rising gradient of 1 in 200. This was certainly one of the best pieces of locomotive work of that period, although tempered as to quality by the use of two engines.

As mentioned previously, "single" engines were generally used on the section of main line between Carlisle and Glasgow, for although the line is heavy, the severe gradients are confined to those up the Beattock bank. From Carlisle to Beattock station they are not exceptionally heavy, the worst being 4 miles of 1 in 200 up. Moreover the train gets a good start from Carlisle, for the line falls gently for 7½ miles from that station. Once over the top of Beattock bank, there is a downhill run the whole way to Glasgow, much of which is 1 in 100, of course making a hard pull for the up trains. The down "Limited Mail" was, however, exceptional in that for a long time it was worked from Carlisle by the Perth 7 ft. 2 in. 2–4–0 coupled engines. At one time (1881) Nos. 34, 118 and 121 were those usually employed. The Perth engines left that station with an up express at 7.45 p.m., and returned with the "Limited" at 4.18 a.m. from Carlisle, but they were always piloted either to the summit of Beattock bank or through to Carstairs by a Carlisle 8 ft. 2 in. single. At one time in the summer months the Perth engines worked the "Tourist" express down, leaving Carlisle about half-an-hour before the "Limited," and during this period the latter train reverted to the Carlisle "eight-footers." When the "Tourist" was discontinued the "Limited" again passed into the charge of the Perth engines.

In the late seventies the then new 4–4–0 bogie engines 125 to 129 were quartered for a short time at Perth, and to No. 125 generally was allotted the Carlisle turn in question. Now although the 125 class were the most powerful express engines that the Caledonian then possessed, there was a something indefinable about them,* and it is certain that at this period they did not keep good time with the down "Limited." Although the load was only 12 or 13 coaches, and they had the assistance of a pilot, they were

* The heating surface was certainly insufficient.



Photo] [*Locomotive Publishing Co., Ltd.*

2–4–0 PASSENGER ENGINE, NO. 130 (SERIES 130–139).

By Dübs & Co., 1877. Wheels, 6 ft. 2 in. Cylinders, 17 in. by 22 in.

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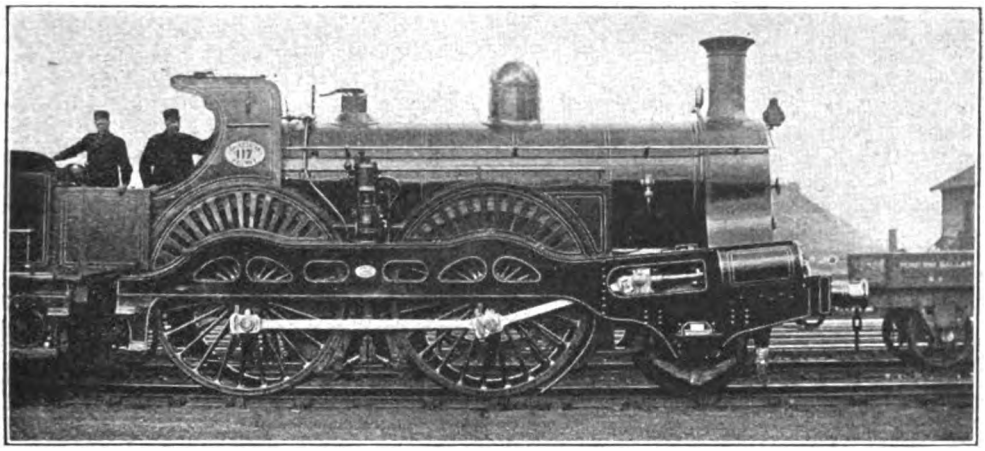

Photo] [*Locomotive Publishing Co., Ltd.*

2–4–0 EXPRESS ENGINE (B. CONNOR).

Neilson & Co., 1868. Rebuilt at St. Rollox, 1894.
Wheels, 7 ft. 2 in. Cylinders, 17 in. by 24 in.

considered to be heavy on coal; it was also stated that they did not steam particularly well, and on occasions burnt their smoke-boxes. Anyway in 1881 the older 2–4–0 engines already mentioned took over their Carlisle work, and the 4–4–0 engines were removed to Dundee, to work to Perth and Glasgow (Buchanan Street).

The bogie engines 125 to 129 were at Dundee for many years. At one time they worked one London train through from Dundee to Carstairs, but their usual work was to Buchanan Street (Glasgow). The Glasgow engines (2–4–0) with 7 ft. 2 in. wheels such as 101, 108, etc., worked through to Dundee in the opposite direction.

The Caledonian passenger engines were painted ultramarine blue with chocolate coloured underframes. The main line express engines were adorned with the lion of Scotland in gilt and red on the splashers. The goods engines at that time were painted dark olive green with black lines. The numbers, before Drummond's time, were always painted either on the splashers or on the boiler.

Of the other main line expresses in 1881, the 5.40 p.m. express from Carlisle was booked from Lockerbie to Beattock, 14 miles, in 17 min.—speed 49·4 m.p.h. The 5.28 p.m. Scotchman ran from Carlisle to Beattock, 39¾ miles, in 48 min.—speed 49·7 m.p.h. This was the heaviest train of the day and frequently totalled 16 six-wheeled coaches, and was often run by one 8 ft. single, though I do not know whether it could have kept the above timing with such a heavy load. One of the best trains in the north was the 9.5 a.m. from Perth which reached Aberdeen—89¾ miles—at 11.40 a.m. with two stops. Between Perth and Dundee there were three trains averaging 41½ m.p.h., and four between Edinburgh and Glasgow which maintained a running speed, deducting one stop, of 41½ m.p.h.

Between the two last named cities the Caledonian was at a great disadvantage as compared with the North British Railway. The latter as the earlier Edinburgh and Glasgow Railway, had been the first in the field, and had selected the most direct route over level country except for the Cowlairs incline into Glasgow station. The Caledonian uses its main line from Glasgow to Carlisle as far as Uddingston, climbing 1 in 100 most of the way, then branches off and joins the Carstairs–Edinburgh line at Midcalder, the gradients being heavy both ways. Over this road in 1886 the 9 a.m. from Edinburgh was allowed 58 min. for the through run to Glasgow (Eglinton Street), a distance of 45¼ miles, which gives an average speed of 46·8 m.p.h. With the 6 ft. 8 in. coupled 2–4–0 engine No. 92 I find a record made by a friend in which the run with a light load of 5 coaches was performed in 56 min. 44 sec., an average speed of 47·8 m.p.h., several miles on the Glasgow side of Uddingston being covered at 60 to 62 m.p.h. This engine was the oldest of the four-coupled express engines that the company possessed, having been built at St. Rollox in 1865.

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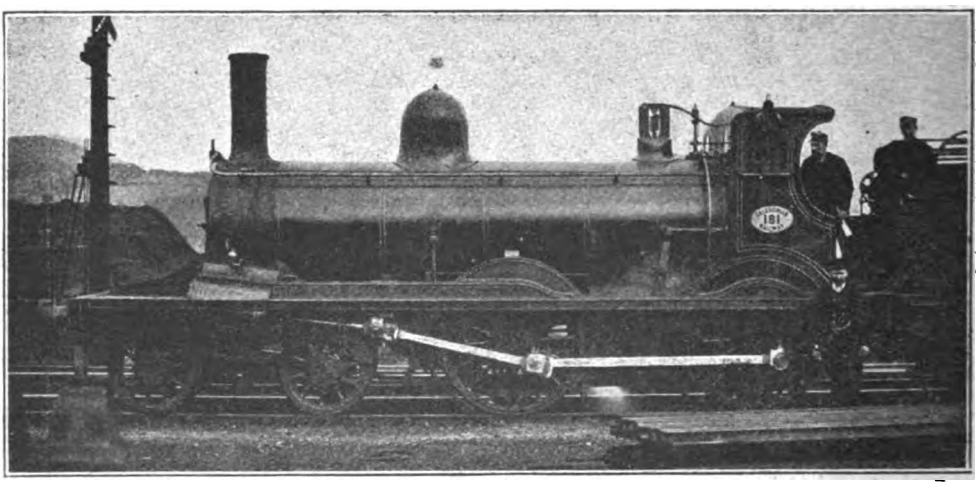
In addition to the four-coupled express engines there was a fairly homogeneous class of 2–4–0 passenger engines for working the stopping trains and certain branches. These were very similar in appearance to the larger engines, but had 6 ft. 2 in. coupled wheels, and cylinders 16½ in. and 17 in. by 22 in. stroke. They were built at various dates between 1869 and 1877 by the firms of Neilson and Dübs, and were Nos. 2 to 29, 49 to 59, and 130 to 139. No. 1 had been one of this class, but this engine was subsequently in 1881 renumbered 61 and at a later date 59. They were quartered at most of the principal sheds on the line, and should be carefully distinguished from the heavier 6 ft. 2 in. coupled express goods engines with 18 in. cylinders to be mentioned later. Of the passenger engines, No. 2 was at Arbroath, whilst 13 at Dundee with 17 at Forfar worked the Dundee and Forfar branch.

A most important branch for tourist traffic in the summer months is that from Callander to Oban, which was completed in sections between 1873 and 1880. The line is heavy and in 1882 ten special engines known as the "Oban bogies," Nos. 179 to 188, were built by Messrs. Dübs and Co. to the designs of Mr. Brittain. They were of the 4–4–0 type with the customary outside cylinders, 18 in. diameter by 24 in. stroke, and the coupled wheels were 5 ft. 2 in. diameter. The heating surface was 1,138 sq. ft., but the grates were of small area, 14·3 sq. ft. only. The weight in working order was 41 tons 11 cwt. Some of these engines have been withdrawn during recent years but a few are still at work. They had four-wheeled tenders, since some of the turntables were too short to accommodate bogie engines with six-wheeled tenders. Both the passenger and the goods traffic on the Oban line was worked by these engines. Previous, however, to the advent of these 4–4–0 engines the Oban line had been worked by various classes. One of Mr. Webb's London and North Western 2–4–2 tank engines was in 1881 lent to the Caledonian and tried on this road, and as it did fairly well the locomotive department of the Caledonian ordered some 2–4–2 tank engines (152 to 166) which will be mentioned later. They were found not to be suitable, and the Oban work was handed over to 0–4–2 mineral tender engines for a time, and although these were not passenger engines they seem to have answered satisfactorily as a temporary stop-gap.

Returning southwards there exists a branch from Lockerbie to Dumfries, which is continued as a joint line partly owned by the Glasgow and South Western Railway to Castle Douglas, and from this place, where the London and North Western and Midland Railways also enter into the joint ownership, it extends to Port Patrick and Stranraer. I have dealt with the Port Patrick extension in my articles on the Glasgow and South Western Railway. The locomotive stock of this railway passed into the hands of the Caledonian and provided eight of the fourteen inside cylinder



4–4–0 PASSENGER ENGINE FOR THE OBAN BRANCH.
Designed by Mr. Brittain and built by Dübs & Co., 1882.
Wheels, 5 ft. 2 in. Cylinders, 18 in. by 24 in.

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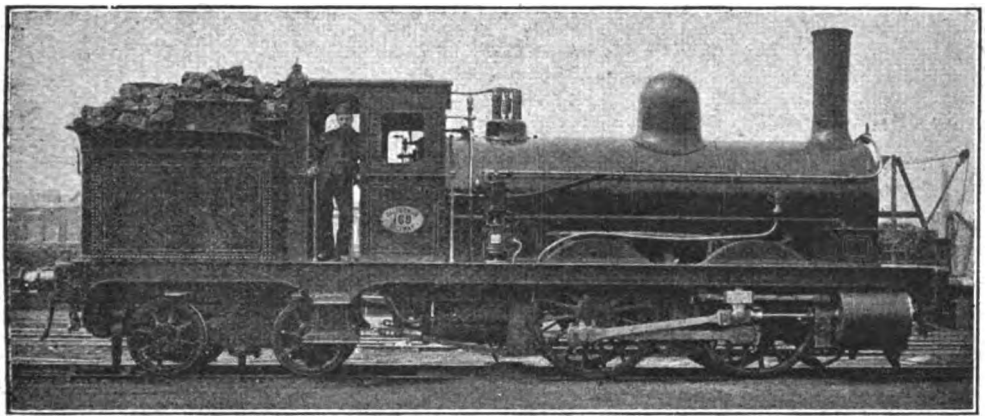

Photo] [*Locomotive Publishing Co., Ltd.*

0–4–4 BOGIE BACK TANK ENGINE, NO. 169.
(Series 167 to 170). Built by Neilson & Co., 1873–4.
Wheels, 4 ft. 8 in. Cylinders, 17 in. by 22 in.

engines which the company possessed. Two of them, Nos. 267 and 268, constructed by Sharp, Stewart and Co. in 1861, were 6 ft. "single" engines, with 15 in. by 22 in. cylinders. They were, in fact, very small "Bloomers" having inside frames throughout, and were designed by Mr. McConnell of the Southern Division of the London and North Western Railway. A four-coupled passenger engine, No. 269, with 6 ft. wheels and 16 in. by 22 in. cylinders, and four 0–4–2 mixed traffic engines, 262 to 265, with 5 ft. wheels and 16 in. by 24 in. cylinders also formed part of the stock. They were mostly broken up in Mr. Drummond's time, but No. 264, one of the mixed traffics, entered into an argument with another train at Dalbeattie in 1874 and suffered so severely in consequence that its days were ended there and then. The other engine was a Crewe-built six wheels coupled goods engine, I believe, of the well-known D.X. class, lent in 1859 by the London and North Western and subsequently retained. This engine was afterwards sold to a cement merchant in Dumfries and eventually broken up there. After the disappearance of these older locomotives, the Caledonian share of the joint line working was taken up by the standard outside cylinder engines of various classes.

The passenger tank engines of the Caledonian were mostly employed in the Glasgow district, and although not very numerous consisted of several classes. Four of them, No. 167 to 170, were of Mr. Connor's design, or at all events were put to work during his superintendency. They were curious little 0–4–4 well tank engines with trailing bogies and outside cylinders of a type of which as far as I remember only one other solitary example existed on British railways. The coupled wheels were only 4 ft. 8 in. in diameter and the cylinders were 17 in. by 22 in. These four engines, which were built in 1873–4 by Neilson and Co., were, however, usually employed in the Edinburgh district, 168 and 169 on the Leith branch and 170 on the Balerno trains, whilst 167 was used as a spare engine and filled up its time by acting as Edinburgh shunting pilot. No. 170 was broken up in 1899, but the others lasted a few years longer as 1167 to 1169.

The larger engines, Nos. 140 to 151, were of Mr. Brittain's design for Glasgow suburban and other branch traffic. They were 2–4–0 side tank engines with the usual outside cylinders 17½ in. by 22 in. and 5 ft. 2 in. coupled wheels, and were built by Messrs. Dübs and Co. in 1879. The tank capacity of 820 gallons was rather small. Two of these tank engines worked the Dundee and Arbroath joint line for some years.

Following these came 15 larger tank engines of Mr. Brittain's design of the 2–4–2 type with Webb's radial axleboxes, outside cylinders 17½ in. by 22 in. and 5 ft. 8 in. coupled wheels. These engines, Nos. 152 to 166, built by Neilson and Co., 1881, were originally intended for the Oban line with its numerous curves, but did not prove very satisfactory on that service. A Scotch

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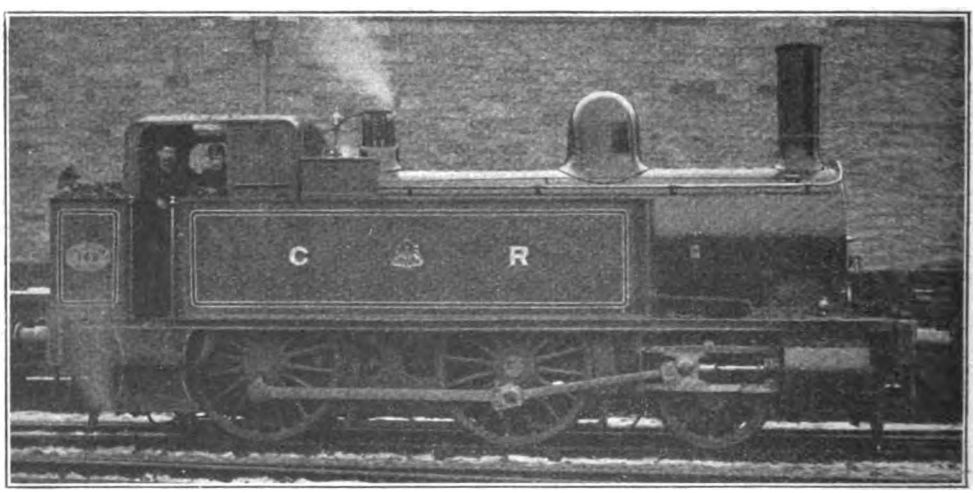
locomotive engineer told me that the curves of the radial axlebox guides were struck from the wrong radius, with the result that the engines showed considerable lateral unsteadiness. Anyway, they often ran hot and consumed a vast quantity of oil. Eventually they were transferred to the Glasgow district for local suburban trains, and when the Central Underground line was opened they were fitted with condensing apparatus to work through the tunnels. They finished their days in this district and the last one was at work about two years ago.

The last two four-coupled tank engines, Nos. 540 and 541, were of the 0-4-2 type with inside cylinders, and were built by Neilson and Co. in 1868, together with two four-coupled mixed traffic tender engines for the Northampton and Banbury Railway. I do not think the latter company ever saw them; I do not know the reason, but it is just possible that the "bawbees" were not forthcoming, and the engines consequently remained on the north side of the border and were purchased by the Caledonian. They were comparatively small engines with 5 ft. 6 in. coupled wheels and 16 in. by 20 in. cylinders. On what branches they afterwards worked I do not know, but at one time No. 540 was a Dundee engine. The Caledonian also took over at the same time the two mixed traffic tender engines, also with inside cylinders, which became Nos. 322 and 323, one of which worked the Brechin branch.

Finally there were two or three four-wheeled tender engines with outside cylinders, the 350 class, originally the property of the Dundee and Newtyle Railway. One of them worked the old Broughty Ferry Pier branch, and probably wobbled about a good deal in the process.

There was one curious little well tank engine, No. 1, with single driving wheels 5 ft. 1 in. diameter and cylinders 9½ in. by 15 in. used at St. Rollox as an inspection engine. It had the peculiarity of not only having the cylinders but also the whole of the valve gear and eccentrics placed outside after the fashion of so many French and other continental engines. No. 1 came out in 1881 from St. Rollox works, but was not the first of its type, for two very similar engines had been built by Mr. Sinclair at Greenock in 1851 of practically the same dimensions, and it is possible that the new No. 1 contained portions of these.

The Caledonian carriage stock was in these days six-wheeled for the main line services, with a large number of older—and sometimes very dilapidated—four-wheelers on the branches. The colour of the coaches was very dark purple. In later years just as the Glasgow and South Western copied the colour of its Midland partner, so the Caledonian took unto itself the purple and cream upper panels of the London and North Western, possibly in order to harmonise with the West Coast Joint Stock vehicles. It also, in company with the other leading Scotch railways, fitted up the engines and stock with the Westinghouse brake.



2-4-0 PASSENGER TANK ENGINE (BRITTAIN).
Built by Dübs & Co., 1879.
Wheels, 5 ft. 2 in. Cylinders, 17½ in. by 22 in.

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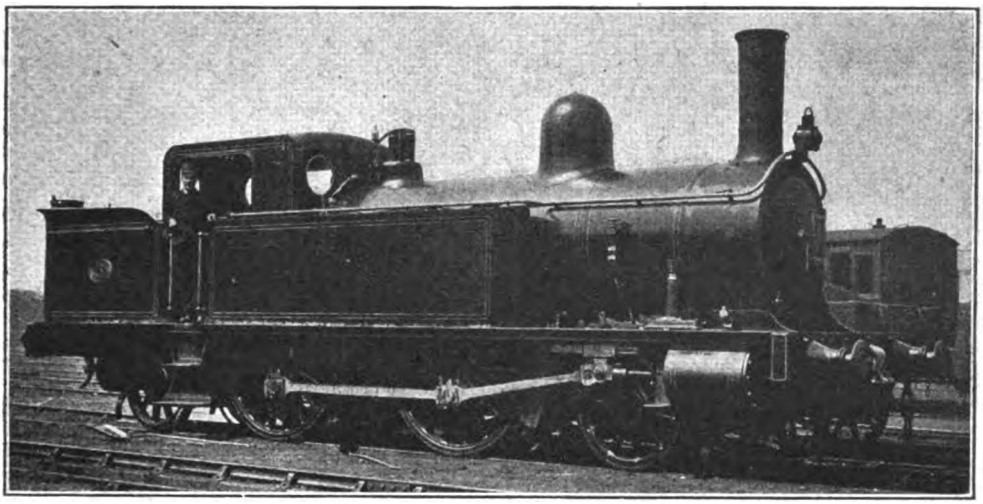

2–4–2 TANK ENGINE, NO. 155 (152–166 SERIES).
Designed by Mr. Brittain. Built by Neilson & Co., 1880.
Wheels, 5 ft. 8 in. Cylinders, 17½ by 22 in.

The goods and mineral engines were almost entirely four wheels coupled in spite of the severe gradients. The affection of most of the Scottish locomotive engineers for four-coupled instead of six-coupled engines for goods traffic was very deep rooted, and on no lines more so than on the Caledonian and those railways which were amalgamated with it. Here again the influence of Mr. Alexander Allan's early practice was evident, and it was faithfully followed by all the locomotive chiefs, Mr. Sinclair, Mr. Connor, and Mr. Brittain.

There were of these goods and mineral engines three main patterns, of which the first or express goods engines might really be considered as passenger engines, though until Mr. Drummond's time they did not do a great deal of passenger work. They first appeared in 1858 from St. Rollox works and were built steadily in the intervening years until 1877. They were 2–4–0 coupled engines with 18 in. by 24 in. cylinders, and wheels of the large diameter of 6 ft. 2 in., and eventually totalled up to an army of 140 all told, which were stabled at most of the principal sheds from Carlisle in the south to Aberdeen in the north. They partook of all the characteristics of the enlarged Allan design. In addition to their main line goods work, two or three of the class were stationed at Beattock as bank engines. Only 14 of them were built at St. Rollox between 1858 and 1864, and all the others came from the works of Neilson and Dübs except half-a-dozen which were built by Beyer Peacock and Co. in 1861.

For slow goods trains there was a smaller 2–4–0 class of similar type of which the coupled wheels were 5 ft. 2 in. and 5 ft. in diameter, and the cylinders varied from 16 in. by 22 in. to 17 in. by 24 in. in 16 of the larger engines. This type of engine, of which there were about 50, was usually employed on the central section of the line, many of them having been taken over with the Scottish Central Railway.

The remaining classes of four-coupled engines were very numerous and used for coal and mineral trains. They were all of a type which was essentially Scottish in origin and use, of which I think only two examples had ever existed south of the border.* They were of the 0–4–2 type with outside cylinders, and although Mr. Allan built a number for the Scottish Central, they do not appear to have originated with him. A considerable number were put into service on the Caledonian in 1848 from the works of Jones and Potts of Newton-le-Willows, and Scott, Sinclair and Co. of Greenock, and from 1849–50 Mr. Sinclair built a good many at the Caledonian works at Greenock. The type continued to be built regularly until 1881, when the last twenty were constructed by Dübs

* In the early days of railways there had been two old "London and Croydon" engines built by Messrs. G. and J. Rennie in 1838–9 of a similar type but much smaller.

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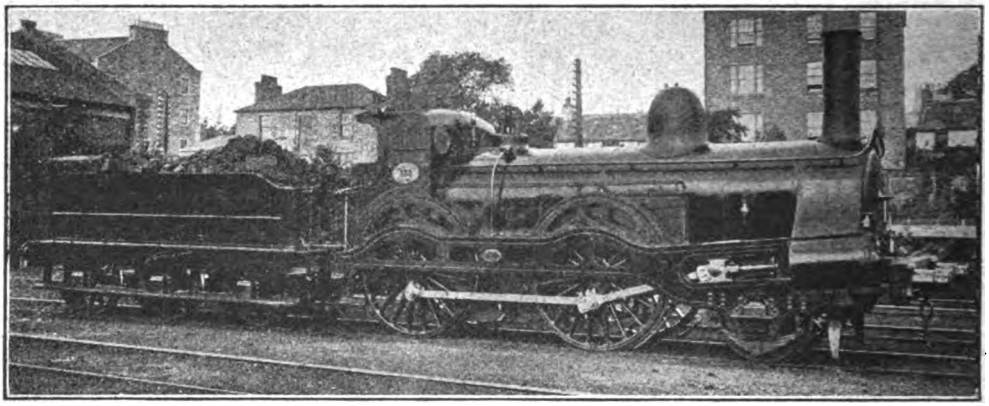
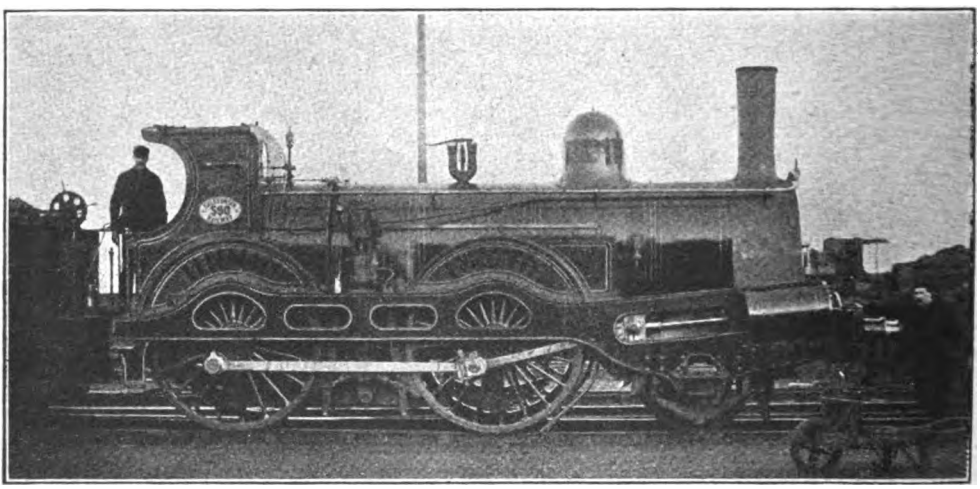


Photo] [*Locomotive Publishing Co., Ltd.*

2–4–0 EXPRESS GOODS ENGINE, NO. 338.
(B. Connor). Built by Neilson & Co., 1870.
Wheels, 6 ft. 2 in. Cylinders, 18 in. by 24 in.

and Co., most of which are still at work. From 1866 until 1881 the dimensions of these engines were more or less standard; the cylinders being 17 in. by 24 in. and the front coupled wheels 5 ft. 2 in. Although the Caledonian with its tributary railways was the chief user of these outside cylinder 0–4–2 engines with comparatively large wheels, there were also a number of them on other lines. To the Sassenach they seemed a peculiar engine for use on mineral trains, but I suppose he did not know enough, and as the Scot seems to have derived much comfort from them, further comment is needless. After all he knew his own business best. A number of these engines are still at work.

I have already mentioned the scarcity of engines with six-coupled wheels on the Caledonian of that period. Of the 44 0–6–0 engines, one, No. 266, has been considered in connection with the Portpatrick line, and two other inside cylinder goods engines, Nos. 542 and 543, were purchased from Neilson and Co. who had built them for an English line. The other 39 engines were heavier mineral engines of one homogeneous class, numbered 631 to 669 and built by Dübs and Co.



2–4–0 EXPRESS GOODS ENGINE, NO. 590.
Built by Dübs & Co., 1872.
Wheels, 6 ft. 2 in. Cylinders, 18 in. by 24 in.

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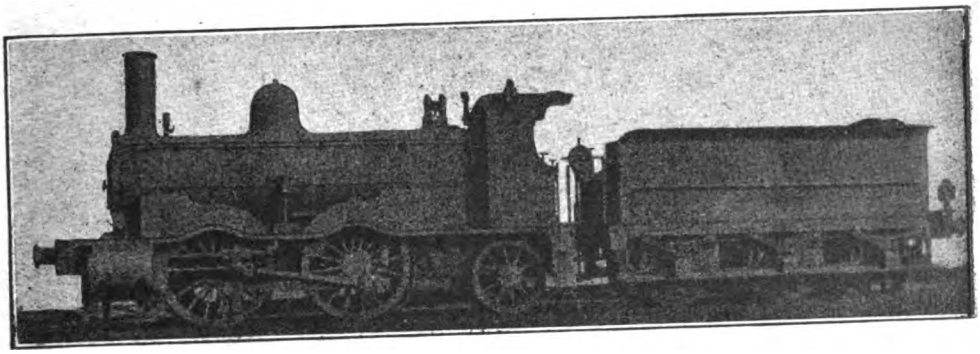

0-4-2 MINERAL ENGINE, NO. 719.
Built by Dübs & Co., 1881.
Wheels, 5 ft. 2 in. Cylinders, 17 in. by 24 in.

1874 to 1877. They were "short-coupled," i.e., all the wheels were in front of the firebox, and are interesting as being the last examples to be built in this country of the old Stephenson "long boiler" pattern. The cylinders were outside, 18 in. by 24 in., the coupled wheels 5 ft. 2 in. in diameter and the engines rejoiced in boiler barrels 14 ft. 5 in. long, but in spite of this they succeeded only in obtaining out of them 1,073 sq. ft. of heating surface, towards which the tubes contributed 990 sq. ft. as their quota. The grates were small, having an area of only 14·3 sq. ft. These engines were used on the heavier coal trains in the Lanarkshire coalfield, and many of them have been broken up during the last few years, though I believe some are still at work.

Of the 23 six-coupled shunting engines one only merits special mention. This was No. 516 by Neilson and Co., 1873, and was stated to have been the most powerful engine on the Caledonian. It was a saddle tank and had a distinctly French appearance with all the motion and eccentrics outside. The coupled wheels were 4 ft. 2 in. and the cylinders were 17 in. diameter, with the somewhat unusual stroke of 25 in. It is possible that this interesting engine may still be in service.

(To be continued.)

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are :—
L. & N.W. : Jan., Feb., March, May, 1915. (All out of print except May.)
Great Northern : June, July, 1915. (Out of print.)
M.S. & L. : Aug., Sept., Oct., 1915. (Aug. out of print.) [out of print.)
Great Western : Nov., Dec., 1915; Jan., Feb., March, April, May, June, July, Aug., 1916. (Jan.
Glasgow & S.W. : Sept., Oct., 1916.
North Eastern : Nov., Dec., 1916; Jan., Feb., March, April, May, 1917. (Jan. out of print.)
South Eastern : June, July, Aug., 1917.
Lancashire and Yorkshire Railway : Sept., Oct., Nov., 1917.
London, Chatham and Dover Railway : Dec., 1917; Jan., Feb., 1918.
Caledonian Railway : March, April, 1918.

In May, 1918, Mr. Ahrons will continue to deal with The Caledonian Railway.

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Railways in Art and Literature.

By BASIL MERCER.

IT was once said by the late Sir Frederick Harrison, while he was general manager of the London and North Western Railway, that it was impossible for outsiders to understand the railway business. This dictum called forth much remark at the time, but, to judge by results, the truth of it is a self-evident fact. While the absolute impossibility of the outsider understanding railways is open to question it must be admitted that the vast majority of the educated classes of the country are not only quite ignorant of railway matters but acquire and cherish curiously erroneous ideas on the subject. A commercial man may have a few pounds in some West African gold mine: in spite of his small holding he generally has a very good knowledge of the business, being able to tell exactly how much gold per ton of ore must be produced to earn a dividend. The same man may have some thousands in railway stock, but for some occult reason he knows nothing about his property, knows that he knows that he knows nothing, and takes no trouble to get any knowledge.

To mention all "the various forms of error," as theologians say, would fill volumes. That these wrong impressions may be at times grotesque is shown by the idea held firmly by a successful business man that locomotives are guided through junctions and round curves: he had noticed a wheel near the footplate that looked like the steering wheel of a motor car, and it required much explanation of track and signals to prove to him the fallacy of his beliefs. Some other popular heresies concern speed—specials are always run at a frantic pace, and the career of the Royal Train is meteoric. Now most specials, with the exception of those which are run by the companies to demonstrate the feasibility of certain train timings, are by no means heroic in their flights: this is because the train is a "special"—an extra turn, in fact—and so has no place in the time-table; consequently it has to be fitted in where possible, which course does not make for high speed. As for the Royal Trains, with one notable exception, they have always been liberally timed, thus leaving a bigger margin of safety and ensuring absolute punctuality and comfort in running. Those famous trains, the "Wild Irishman" and the "Flying Scotsman" are by no means "fliers" when compared with many expresses run by the same companies, and a very cursory inspection would show several good reasons for this: these trains are always heavy; they make numerous calls for important connections, and the train's actual journey is a long one. Time-keeping with trains that run practically non-stop between London and Liverpool, Leeds or Brighton is a much simpler matter than with the longer distance expresses. Even geographical text books are full of mistakes: shortest *practical* routes between two centres are given as the crow flies, irrespective of ownership or physical junctions, and the fact that part of the route chosen may be a long single line loop with heavy grades and severe curves. And the lay opinion about railway law is likewise hazy; some appear to think that a railway company has but little status, with others credit it with all the powers of martial law.

When one regards some of the above curious misunderstandings it comes as quite a surprise to find a far more correct view taken in the realms of literature and art. Among the makers of pictures there are some extremely crude ideas, but this often arises from the artist regarding the railway part of his picture as of secondary importance. Two good instances of this custom are found in Turner's "Rain, Steam and Speed"—where a savage locomotive like the Midland wyvern come to life is seen advancing in a mist—and in the late Mr. McWhirter's "Night Express passing Berwick"; in this, as in the Turner painting, there is more impression than detail, Berwick being vague while a black line and some sparks denote the night express. On the other hand Mr. Arnesby Brown's railway matter, though never the centre of attraction, is commendably correct, and, going back some years, the faithful detail of Frith's "Railway Station" ought to commend it to everyone interested in railways.

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Of the present generation M. Emile Verpilleux deserves a first prize for his coloured wood engraving, "St. Pancras Station": he gives an excellent study of that terminus (interior) just after the arrival of a train; although the engine is head on it is unmistakably Midland and all other details are correctly set forth. Some of the earlier railway handbooks, such as the "Midland Counties Railway Handbook," and Roscoe's books on the London and Birmingham and Grand Junction Railways contain plates that compare favourably as regards accuracy with the drawings of a much later period.

Pictures by foreign artists are fairly evenly divided between good and bad (or true and false). Paris, Berlin and Vienna have produced some excellent work. One particular painting comes to memory: it depicts the departure of the boat train from the *Gare Maritime* at one of the cross channel ports in France, a very good railway picture except that the engine had green and red headlights. There was also a quaint Russian work in which a locomotive with a connecting rod at an impossible angle was painfully dragging a peculiar train over the snow-clad steppe, no rails being visible.

"The Stage is the mirror to Nature," and on the whole does not unduly distort railway facts. Actors are much more careful than painters about technical detail, at all events as regards modern life; they may make occasional blunders in historical matters but in customs of to-day are generally careful to study the correct surroundings. Conversely, perhaps, the cinematograph film makers, especially Americans, are inclined to be careless, particularly about signalling. Some fifteen or twenty years ago there was a wonderful melodrama, with a station scene somewhere in the wilds west of Chicago: the locomotive which came on with a goods train and stopped for refreshments did everything it should have done in the way of making noises and exhausting steam, such little things as cylinder cocks being in the right place and used at the right time. In a play called "The Witness for the Defence" the signal lamp could be seen through a window at the back: when the train was about to approach, this turned from green to red—and many other instances of almost meticulous care could be given. Railway uniforms are a weak point, though, and could do with more attention. The comedy element, of course, has licence, but comedians in railway burlesques generally get their laughs by a clever parody of the real thing which is in itself evidence of knowledge.

Writers of fiction are like painters in their handling of railways in that they make correct and inaccurate portrayals, but the average of the former class is much higher. But what puzzles the observer is that there should be any large amount of error: men (and women too) who write correctly about the extremely difficult technicalities of naval and military matters fail when confronted by a railway situation. This is curious because the railway is always with us—it is part of the daily life of most people. And it would be as easy to avoid "bloomers" in this as in other subjects: very few authors let their characters buy fowls from a butcher. Still, although the novelist might be trading on artistic licence he is not nearly so bad an offender as many writers of what are called "descriptive" articles on railways, while the amazing statements that newspaper people set down make one wonder whether they have ever been in a train at all. The *Evening News* thus chronicles an incident on the Brighton line: "—— flames were seen to burst from the engine. It appeared that the 'blower' had caught fire." We learn further that, though the driver was badly burned, the stoker (there are no railway firemen in newspapers) only sustained slight injuries, and that "the burning engine was removed."

Turning to some literary railroadiana one finds from time to time pleasant little fragments which the writer uses to complete his pen-picture of some happening or locality. Robert Louis Stevenson, in a novel written many years ago called "The Wrong Box," says that "Winchester is famous for two things—its cathedral and the leisurely passage of the trains on the London and South Western Railway"; anyone who remembers the train service of the period of the book will be struck by the extremely happy choice of adjective. Stevenson also gives a good description of a night journey to Scotland by the East Coast Route in "The New Arabian Nights." Winchester also figures in "The Relentless City" by E. F. Benson, but this time it is the Great Western line near Cheesehill that is described:—"The only drawback to the charming situation of the house was that a curve of a branch railway-line to Winchester passed not far from the garden. Trains were infrequent on it on week-days, even more infrequent on Sundays. But at this moment

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the thump of an approaching train was heard, climbing up the incline of the line.

"Brutalité, brutalité, brutalité," said the labouring engine.

She turned to him.

"Even here," she said—"even here is an elbow, a sharp elbow. Utility, utility! Did you not hear the engine say that?"

The great Charles Dickens is sometimes mentioned as describing railways more completely than most writers, but it is to be feared that the *matèriel* rather suffers by being made into a mere background for the story. In "Our Mutual Friend" he more than once makes signals change from green to red for trains to proceed on their way: to balance this there is, in "Mugby Junction," a signal at a tunnel entrance that is *always* red. And coal is used as a fuel on the Brighton Railway long before that company had given up using coke as a source of heat. Dickens also records a South Eastern engine which, when standing still, "expectorated boiling water and red hot cinders." The railway interest is also merely subsidiary in R. M. Ballantyne's book, "The Iron Horse, or Life on the Line"; from the title one would expect much, but the descriptions of the working of the line are sketchy, though the characters and private lives of the enginemen are enlarged on.

It might be thought that mere characterisation of people who work for railways would present no special difficulties to minds trained by long usage to portray the varying types of humanity, but this is not invariably the case; the mere fact of the subject being something on a railway seems enough to create a sort of haze, through which there is no means of penetrating except by diligent use of the imagination. Even Mr. Pett Ridge, himself once a railwayman, is not always true to type in his book, "On Company's Service." The late Ian Maclaren, however, has some charming studies, very faithful to life; his shunter at the Buchanan Street station of the Caledonian Company is a delightful piece of character writing, and there are several others. That part of Mr. S. R. Crockett's "Cleg Kelly" which deals with the railway interest is a delightful part of a delightful book; guards, drivers, gangers, stationmasters, booking-clerks, including the gigantically-framed porter Muckle Alick, are all real railwaymen—they live and are part of our own world. Then, too, the author's remarks about railway work in general are well-written and eminently sensible. This careful attention to detail, far from detracting from the narrative, adds greatly to its interest: most people who have read this book once read it again—many times.

Irishmen are popularly supposed to have so much of the artistic temperament that one might expect an Irish writer to be "all over the place" where railways are concerned. This, however, is not the case with "George A. Birmingham"—that same care for detail is used which gives his wildest fictions their air of probability. In "The Major's Niece" the arrival of a branch train at a wayside station "somewhere in Connacht" is thus described: "—— the engine panted round the curve outside the station and dragged up to the platform two coaches and a luggage van," which one might expect on a branch where the traffic is sparse. Nor is there any wholly unnecessary "camouflage"! There is considerably more railway matter in "The Simpkins Plot." After a breezy description of the platform at Euston prior to the departure of the night Irish Mail there are some beautiful remarks about the manner in which the morning mail is despatched from Broadstone station, Dublin:—"There are a few things better managed in Ireland than in England, and one of them is the starting of important railway trains. The departure, for instance, of the morning mail from the Dublin terminus of the Midland Great Western Railway is carried through, day after day, with dignity. The hour is an early one, 7 a.m.; but all the chief officials of the company are present, tastefully dressed. —— They (Englishmen) must, of course, be got into the train, but the doors of their compartments are not locked. It has been found by experience that English travellers object to being imprisoned without trial, and quote regulations of the Board of Trade forbidding the locking of both doors of a railway carriage." Further down the line the hero of the story has trouble for travelling first with a third class ticket: "He flatly refused to move from the carriage in which he sat. The guard, the stationmaster, a ticket-collector and four porters gathered round the door and argued with him. Meldon argued fluently with them. In the end they took his name and address, threatening him with prosecution." From these lines the reader will be able to see what opportunities there are for grotesque mis-statements, and to notice how skilfully the author has triumphed over what has so

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often proved a stumbling block to so many of his brethren of the pen.

The unexpected often happens, though one does not expect a novelist of the calibre of Sir Arthur Conan Doyle to trip lightly into errors, railway or otherwise, for he is essentially one of the moderns and a scientific man. A few years ago there appeared in one of the magazines a series of miscellaneous tales, since collected in book form under the title of "Round the Fire Stories," among which is a story called "The Lost Special." Perhaps it is not surprising that it did get lost, as it was routed from Liverpool, Lime Street, to London *vid* St. Helen's (not St. Helen's Junction), Collins Green, Kenyon and Manchester! However, the special got mislaid between Kenyon Junction and Barton Moss—the two intermediate stations were not asked about it, so say nothing—by the simple expedient of connecting a disused colliery branch with the main line. How this could have been done in broad daylight on such a busy section of the London and North Western Railway is quite beyond the imagination; it can only be supposed that everyone connected with the company's ways and works in those parts had suddenly fallen into a trance. To add to the difficulties, the fireman of the special, having killed the driver, took the train "running at great speed" on to the newly-connected branch—the imagination must again work overtime—which led to the mouth of a disused pit-shaft; into this the train fell and got "lost." Faith, as an Irish cleric once said, is believing things that you know to be untrue.

This, however, is an odd story, a thing by itself and the only one of its kind in the book. But it comes as a rude surprise that the creator of Sherlock Holmes, one of the most wonderful characters in the literature of our age, should fall into such odd errors whenever he touches a railway. Perhaps the egregious Dr. Watson looked after that department? An instance may be remembered in "Silver Blaze," when the party returns from Dartmoor by the South Western in a Pullman to Victoria; now, Pullmans have never been run on the West of England line and the South Western's London terminus is not Victoria. A more modern example of Mr. Holmes' weak spot may be found in "The Bruce-Partington Plans," which is included in Sir Arthur's latest book, "His Last Bow." Here the story opens with the finding of a man's body on the line outside Aldgate station: Holmes traces the cause of the crime to a house near Gloucester Road station, situated over the Inner Circle roads; out of a window in this house the body was lowered on to the roof of a passing train, conveniently held up there. It (the body) travels all the way to Aldgate before it falls off, and only does so there because there is a combination of curve and points; the train, that same night, "is broken up and the coaches redistributed"—a most unusual thing with Circle train sets. At the inquiry no ticket is found on the dead man, so Holmes remarks to Watson:—"No ticket! According to my experience it is not possible to reach the platform of a Metropolitan train without exhibiting one's ticket." Perhaps Mr. Holmes never travelled in the "rush" hours! Several points of railway interest are raised in this tale. The situation of the house in "Caulfield Gardens, Kensington," so convenient for the crime, is rather far-fetched but within the bounds of possibility, although at the spot described it would be very unusual for trains to halt regularly, as there was no signal. Such a stoppage has occurred since the electrification owing to failure of current, but the period of the tale is in the steam days. Then, again, whether the train travelled *vid* Bayswater or *vid* Victoria is not mentioned, though this seems immaterial; there are many curves and points, in combination or otherwise on both routes—the junction with the Hammersmith line, King's Cross, Farringdon Street, Moorgate, Victoria and Mansion House come to mind at once. So why the body should stay on the sloping roof of a by no means easy-riding coach during its many lurches is scarcely more probable than the fact that nobody, passenger or company's servant, noticed anything on the roof in spite of the many opportunities for looking directly down on to the train. There are several minor errors also, but it must always be a source of curiosity how they come to be there at all in the work of an author, usually so exact in detail, like Sir Arthur Conan Doyle.

Baroness Orczy, too, has a murder story about the Metropolitan, one of those in her celebrated book of detective stories, "The Old Man in the Corner." The authoress has evidently made a careful tour of the line she was going to describe, and makes Aldgate the terminus for a train from Addison Road: she also introduces an effective bit of local colour by quoting the well-known Metropolitan advertisement, "best, cheapest, and

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quickest route to the City and West End."

Some writers never pause to consider the possibility of their statements. In common with several others Mrs. Hodgson Burnett, of "Little Lord Fauntleroy" fame, speaks of a man who "must leave for Scotland by the five train"; the most diligent search of time-tables will produce no train whose departure time for Scotland has ever been anywhere near 5 p.m. A similar case is provided by the youthful author of that clever school story, "The Loom of Youth"; the school in question is in Derbyshire, but the boys return to it from Waterloo and by the 8.10 p.m. from Exeter. In a thirty years' old book called "Fifty-two Stories for Boys" there is a wild tale of two boys who, while pottering about (on the main line) on an engine are chased many miles down the line by another engine in charge of a drunken driver. The *dénouement* was delightful: the boys' locomotive is overtaken by the other, and, the alcoholic driver having happily fallen asleep by his fire, one of the heroes clambers over and secures him with some rope. Racy, but improbable! Then there was an exciting "penny dreadful," the hero of which, a North Western fireman, rises to be general manager and marries the Chairman's daughter after a career so full of accident and incident that one wonders how the line kept open. There was plenty of adventure in a *Strand Magazine* story, "Stopping an Execution," where the missing witness finds that the only way he can get to the gaol in time to save the condemned man is to hang on to a mail bag and be "picked up" by the net of a travelling post office van. The venturesome one gets there in time, though covered with bandages—the male in question was nearly killed by the mail! Among the early magazines there is a very clever and humorous tale of the Railway Mania of 1845 in *Blackwood's*, and Professor Aytoun, the writer, is far more correct than many of the moderns.

Among writers of fiction who talk about railways Rudyard Kipling stands pre-eminent. Mr. Kipling is famous for his wonderful correctness of detail, nor does he fail when he discusses railways—he gets both accuracy and atmosphere. In "From Sea to Sea," a journal of travel in India, Japan and the U.S.A., there are many descriptive references; this is Japan. "A lapis-lazuli coloured locomotive which, by accident, had a mixed train attached to it happened to loaf up to the platform just then, and we entered a first-class English compartment. There was no stupid double roof——it was a London and South Western carriage." And "the train is allowed to go as fast as fifteen miles an hour and to play at the stations all along the line." When this journal was written railways in the Western States were primitive, but some of the descriptions apply to this day. "The Oakland railway terminus, whence all the main line trains start, does not own anything approaching a platform. A yard with a dozen or more tracks is roughly asphalted, and the traveller skips merrily across the metals ——." He speaks grimly of the cars being set on fire by their oil stoves after an accident and the chances of escape:—"It is easier to get out of a full theatre than to leave a Pullman in haste." Mr. Kipling is aware of the difference between the American road and ours; "—— the metals were spiked down to the ties with such versatility that the spikes or the tracks drew under the constant vibration of the traffic, and the metals opened out." Then there is the ascent of the Rockies: "The train ran violently up a steep place and was taken to pieces. Five cars were hitched on to two locomotives, and two cars to one locomotive." Follows a wonderful account of the climb itself, up grades, round curves, through snow sheds. In this same book is "Among the Railway Folk," the narrative of his visit to the East Indian Railway shops at Jamalpur, in which the human side as well as the mechanical is commented upon. "The railway folk, like the army and civilian castes, have their own language and life, which an outsider cannot hope to understand." (Did Sir Frederick Harrison read this?) Then the writer goes into the heavy repair shop; "Engines are the 'livest' things that man ever made. They glare through their spectacle plates, they tilt their noses contemptuously, and when their insides are gone they adorn themselves with red lead, and leer like decayed beauties." There is also a brief railway description in "Kim," where Kim and the lama travel from Lahore to Umballa.

"The Day's Work" contains much that is good—"The Brushwood Boy" and other things; it also contains Mr. Kipling's three best "railway" stories. "007" is a wonderful tale of a new engine's first day in steam: he was an eight-wheeled "American" locomotive (note the correct wheel specification); although the scene is laid in the States all the technical terms—they

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differ from ours—are accurate. "007" gets a hot box: "He (the engineer) just bad-worded 007, and pulled yards of charred cotton waste from about the axles, and hoped he might some day catch the idiot who had packed it." The locomotive hero of the story is sent to the rescue of a "Flying Freight" which had been derailed, and the source of the mishap is described picturesquely. "The Mogul himself had waddled into a cornfield ——. His tender had thrown coal over him, and he looked like a disreputable buffalo who had tried to wallow in a general store." An interesting point in this tale is that locomotives are always spoken of as "he."

Also in "The Day's Work" are "An Error in the Fourth Dimension" and "My Sunday at Home." In the first-named, Wilton Sargent, an American gentleman, owner of many thousands miles of track "at home," flags the crack express of a big English railway that used to be very fond of giving its expresses pet names. Some acrimony follows—Mr. Sargent cannot be made to see the enormity of his offence, even when his friend explains in horrified accents: "But its *the* 3.40—the 'Induna'—surely you've heard of the Great Buchonian's 'Induna'?" Sargent returns to America: he had tried to be English and to understand English ways, but he failed to understand English railways. The second story tells of a journey by a train that is—well, not quite an express. "The train stopped in a blaze of sunshine at Framlynghame Admiral, which is made up entirely of the name-board, two platforms, and an overhead bridge without even the usual siding. I had never known the slowest of locals stop here before, but on Sunday all things are possible to the London and South Western. One could hear the drone of conversation along the carriages, and, scarcely less loud, the drone of the bumble-bees in the wallflowers up the bank." So perfect is the picture that it seems almost unnecessary to say that it was Sunday.

But even Mr. Kipling trips once. In a story from "A Diversity of Creatures" called "In the Same Boat" he makes a train from Waterloo get rather off its beat. "The train was running under red cliffs along a sea-wall washed by waves ——"—a description that applies peculiarly to the Great Western between Exeter and Newton Abbot. This is a curious *bévue*, because the first mention of the train is absolutely correct: "The old 10.8 from Waterloo to the West was an all-night caravan that halted, in the interests of milk traffic, at almost every station."

Sir Arthur Quiller-Couch gives a little sketch in "Dead Man's Rock," evidently written before they had expresses in the Delectable Duchy. "We reached Plymouth shortly after five—the train being late—and here the crowd in the carriages grew greater ——. How slowly the train dragged through Cornwall!" And further on, "It was already half-past eight as we changed our train at Truro, and here again more time was wasted." These lines refer to Christmas Eve, and old travellers to the Far West, especially on the eve of a holiday, will see how true to life it is. Cornwall is a gentler land than the Home Counties, and people do not hurry so much, even on the Great Western.

Poets, save the most minor ones, seldom look to the railway as a source of inspiration. It is impossible to say why this should be; for ocean steamers, mail coaches, motors and bicycles have all been described in verse. Some there are who revile all railways—Wordsworth attacks the Windermere line in a poem beginning "Is there no nook of English ground secure from rash assault?" But there is no really great poem on the subject; we may say with Kipling, "Lord, send a man like Robbie Burns to sing the song of steam."

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Great North of Scotland Railway.

AN IMPORTANT CHANGE IN OFFICERS.

EARLY in April, Mr. William Deuchar, Superintendent of the Line, Great North of Scotland Railway, is to retire from the service after a railway career extending to forty-seven years with the company. Born in 1849, a native of Auchterless, he commenced railway life in 1871 in the outdoor staff, having been station porter and pointsman, afterwards entering the running grade in the capacity of train brakesman. In 1877 Mr. Deuchar was invited to take the post of Chief Assistant to the Train and Passenger Superintendent, Mr. Forbes Morrison, and in 1900 he was selected for the responsible position of Passenger Superintendent. During the long period covered by Mr. Deuchar's service the Great North Railway system has been greatly extended and improved. The Moray Firth Coast line from Portsoy to Elgin was opened in 1886, the Cruden branch line from Ellon to Boddam was opened in 1897, and in connection therewith the railway company built the Cruden Bay Hotel and laid down the celebrated golf course there. The light railway from Fraserburgh to St. Combs, the first railway of that character in the north-east, was opened in 1903 to afford railway facilities to the fishing population of Cairnbulg, Inverallochy and St. Combs. Mr. Deuchar has been a member of the Superintendents' Conference at the Railway Clearing House in London for eighteen years, and is now one of the oldest members. He was Chairman of the Conference in 1913.

Mr. William Johnston, who succeeds Mr. Deuchar, has received a training in all railway departments during his thirty-seven years' service with the Great North of Scotland Railway. He joined as a boy clerk, and after serving at general country stations was transferred to the Passenger Superintendent's office in Aberdeen, where he remained for five years, being subsequently appointed relief stationmaster and clerk, in which capacity he spent six years. Thereafter, for sixteen years, Mr. Johnston was one of Mr. Deuchar's principal assistants in the Passenger Superintendent's office, taking charge of the rates, fares and claims departments, which duties included the looking after competitive and executive traffic. While in this department he was brought into contact with representatives of other railways, having attended Clearing House and other meetings with or on behalf of the former Superintendent, Mr. A. G. Reid (late General Manager, Dublin and South Eastern Railway) and Mr. Deuchar. For the last five years Mr. Johnston has been chief clerk to Mr. Davidson, the General Manager.

MR. WILLIAM DEUCHAR.

MR. WILLIAM JOHNSTON.

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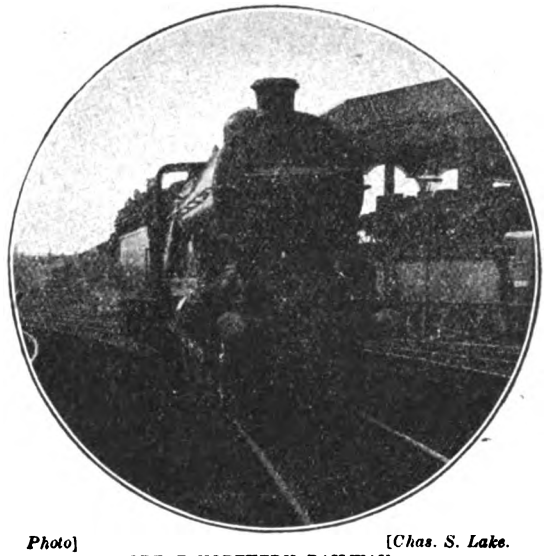
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

4–4–2 express engine, No. 1409.

SINCE I commenced writing these articles there appears to have been no subject on which I have ventured to comment that has aroused such general interest—if the volume of subsequent correspondence may be taken as evidence—as the exchange of locomotives in 1910 between the Great Western and London and North Western Railways, dealt with in the February issue. But in order that we may not be too circumscribed in our subject matter, I am deferring further consideration of this thorny topic, as also of the questions of simple and compound expansion, and of high working pressures, which have similarly elicited a number of letters, until a later date. Meanwhile I should like to make a few remarks on a subject of some general concern at the moment, and that is as to the nature of the express passenger train services which will be put into force in the reconstruction period after the war.

The idea was suggested to me by a recent letter from a friend, who has written some able articles in the same connection for a contemporary, and who asks whether I proposed to raise the question of "the possibilities of after-war express timings," or if the future is "altogether too problematical and uncertain for any opinions to be ventured in print. You adopt the line at present," he continues, "that, considering the circumstances, our train services are wonderfully good. I quite agree but one must not forget the qualification. In a recent article I maintained that the future should produce great accelerations, and, although the amount of observation on which I can base my opinions is small as compared with yours, I would hazard the guess that, as far as locomotive power goes, you would admit the practicability of much increasing speeds, with loads restored to something like their pre-war size, or even fairly substantially added to above that figure. That is to say, the question of what the standard of express speed should be will become a question of policy rather than of possibility. But it always seems to me that, as the object of rail transit is to annihilate distance, the more thoroughly it can be annihilated, the better."

It so happens that about six months ago I wrote a couple of articles for the *Railway News* on this self-same subject, under the title of "The Problem of Passenger Travel after the War," from which I might perhaps quote certain of the principal contentions. In the first place I sought to point out that, in the British Isles, beyond the distinctions afforded by class, first and third—and second, in the few cases where it continues to be employed on main lines—the traveller is charged a "flat rate" for his transportation, irrespective of the conditions under which he is conveyed. For instance, in the matter of journey time, whether he is carried by an express, or a semi-fast train taking half as long again between starting-

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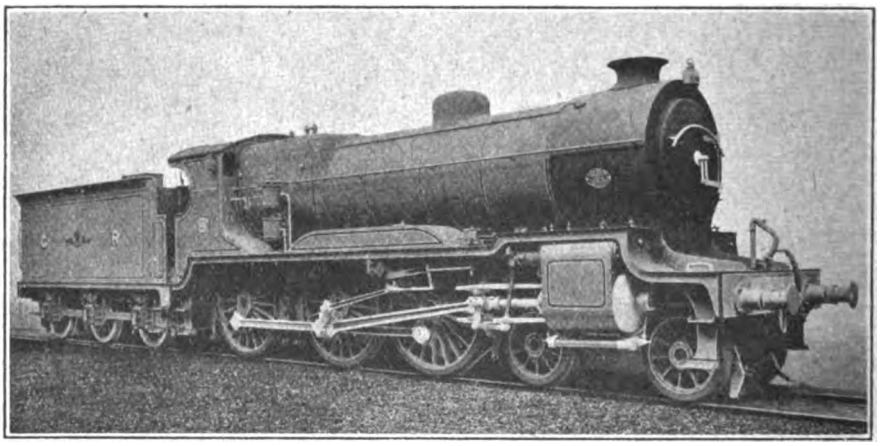
point and destination, or a "slow" occupying nearly twice as long, the rate per mile is the same. As regards comfort, there is no distinction made in the rate per mile between travel in early non-corridor stock, and that in the latest vestibuled cars with restaurant and lavatory accommodation, and all possible conveniences. Other, that is, than the distinction between class and class, but at the same time it would often be possible to find on any one railway first class coaches in main line use inferior in comfort to the more recent third class vehicles of the same company, so that, in such cases, the only return gained for the 100 per cent. increase of fare paid by the first as compared with the third class passenger is increased privacy—in pre-war days. That is to say, speed and comfort in travel have not of recent years been marketable commodities, as they reasonably ought to be.

This is the result of the competitive traffic conditions which have for so long existed in these islands. Time was when principal expresses were confined to the use of first class, or first and second class passengers only, and were subject to special levies known as "express fares," either or both of which conditions only survive—or did so immediately before the war—on certain of the Southern and of the Irish lines. Competitively, the express fares first vanished, and then, as the democratization of our train services proceeded, all the principal companies, with very few exceptions, followed one by one the lead of the Midland and Great Eastern Railways in 1872 in admitting third class passengers to all trains. From this point continued competition had the gradual effect of speeding up the principal train services—lines not directly affected having to follow suit in a more or less degree in order to keep abreast of the times—and increasing their luxury, without any corresponding increment in the cost of travel to the consumer.

One of the most striking examples of this competition was seen in the services between London and Birmingham by the Great Western and London and North Western Railways, totalling 26 2-hour trains in all daily over a route varying from 110½ miles in the former case to 113 miles in the latter, in all cases restaurant-car equipped, together with four others occupying from 125 to 130 min. That is to say, 15 trains in each direction ran daily between the two cities at a general average speed of 55·5 m.p.h. And yet at the present time only 20 trains in all, both up and down, contrive to make the journey in three hours or less. Their average time is one of 2 hours 42 min., and their average speed 41·4 m.p.h. If this service suffices to convey the same traffic, the remarkably generous nature of the previous provision



CALEDONIAN RAILWAY.

4–6–0 express locomotive, No. 938 (Robinson superheater).
Cylinders, 21 in. dia. by 28 in. stroke. Driving wheels, 6 ft. dia. Heating surface, firebox, 140 sq. ft.; tubes, 1,460 sq. ft.; superheater, 448 sq. ft.; total, 2,048 sq. ft. Grate area, 25·3 sq. ft. Working pressure, 170 lbs. per sq. in.
Built by Messrs. Hawthorn, Leslie & Co., Ltd.

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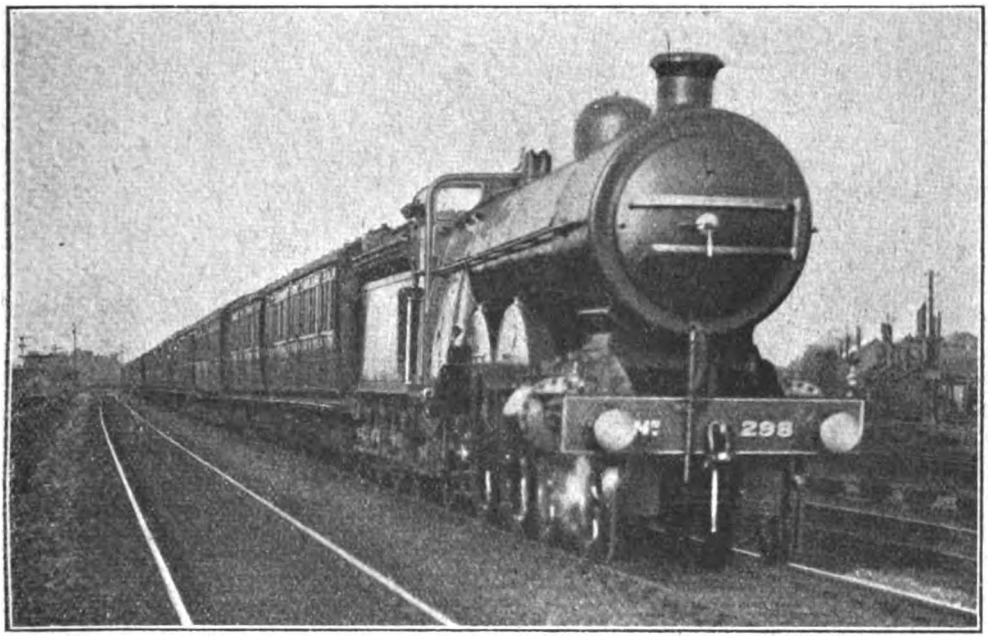
—even allowing for present conditions, for the wartime diminution in the number of passengers travelling, and for the fact that the competitive trains of both companies served other towns in the Black Country and beyond—is clearly demonstrated. The principal point which I wish to emphasise, however, is that lavish facilities of this character were provided for the passenger at no cost over and above the ordinary fares.

Now this is practically the only country in the world where such conditions obtain. Prior to the war all the chief Continental parlour, sleeping and restaurant cars, the passenger by which is subject also to special rates. That is to say, the traveller is made to pay proportionately to the speed and comfort of his journeys, as at one time he had to do in these islands also, and rightly so.

Now it is quite evident that the greatly enhanced cost of British railway operation after the war will require to be met by new methods of operation, and by increased charges for the cost of conveying both passengers and merchandise, as compared with those in vogue before the war. As regards passengers, the step has already



Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

Up express, Newcastle to London, passing New England (Peterborough) locomotive and coal sidings. "Atlantic" type locomotive, No. 298.

expresses were limited to the use of first and second class passengers only, or, in certain cases, were composed of first-class coaches only, while on various lines "express fares" were charged for the use of the faster trains. The fastest and most comfortably equipped "fliers" were the famous *Trains de Luxe* of the International Sleeping Car Company, composed of sleeping and restaurant cars only, for the use of which a heavy supplementary rate over and above first-class fare was levied. Similarly in the United States and in Canada the chief expresses are limited trains, made up of luxurious Pullman

been taken of increasing the fares by 50 per cent. If the whole of this increase were retained, it would press hardly on certain sections of the community, especially in respect of long-distance journeys. The solution which was in the first instance suggested to me by a friend, and which I put forward in the articles just referred to was, therefore, that second class be reintroduced on main lines, at the existing third-class rate of 1½d. per mile, that for third-class travel the Parliamentary fare of 1d. per mile be reverted to, and that first-class charges remain, as at present, 3d. per

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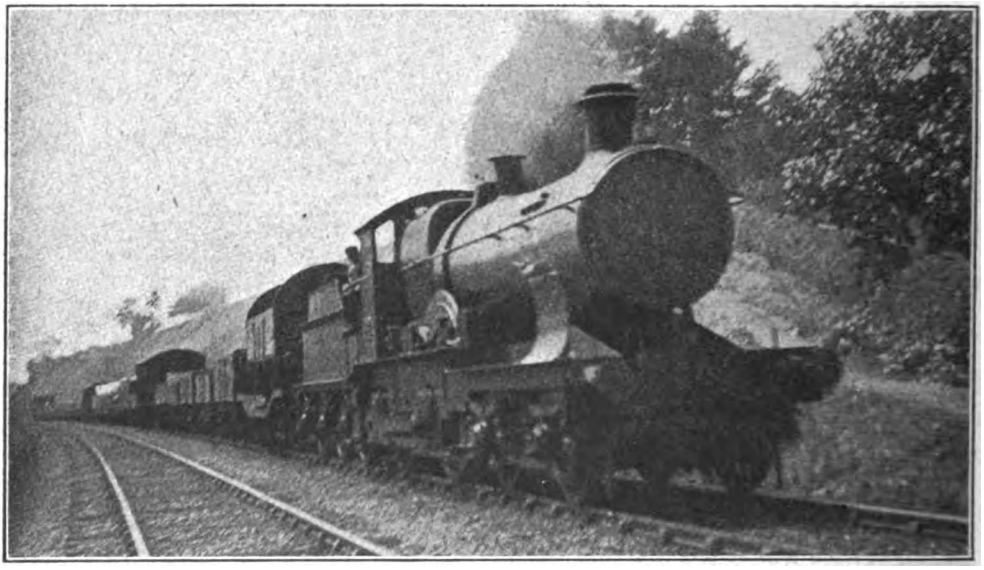
mile. All the existing main line third class corridor and restaurant car stock could be redesignated second class, the earlier third class non-corridor coaches becoming the standard third class vehicles. As a natural corollary, express trains would be composed of first and second class coaches only, while third class passengers would be confined to semi-fast and slow trains, except perhaps, in respect of the longest distance journeys, as those between England and Scotland. Thus we should come more or less into line with the other countries of the world in proportioning the rapidity and comfort of journeys to the rate per mile paid.

day, national travelling requirements can be met with a much curtailed service of trains, and that modern locomotives can, without undue difficulty, handle loads in regular service that were almost unheard of but a few years ago. In this way travelling facilities practically equal to those provided prior to the war, save as regards the increased cost of travel to the "consumer," could be operated much more economically than hitherto, so far as the railways are concerned.

But the question is as to whether facilities "equal" to those in existence in pre-war days would meet the case. As my corres-



Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Through goods train near Betchworth, on the Reading branch, hauled by Great Western Railway 4–4–0 locomotive, No. 3384, *Swindon* ("Bulldog" class).

The amount of travelling which has taken place under wartime conditions with the third class fares 50 per cent. above their normal level, seems clearly to prove that express trains composed of first and second class coaches only and conveying no passengers at under 1½d. per mile covered would not lack patronage. Another wartime lesson has been that, given suitable arrangements between the various companies working competitively as to interavailability of tickets and adjustment of train times in such a way as to spread the departures from competing stations as uniformly as possible over the hours of the

pondent pointed out in an article of his own, the provision of very fast trains has a value above and beyond that of the immediate revenue they may secure. Goods traffic is the result, in the first instance, of business relations, and those relations can be fostered, and business transactions take place that might not otherwise have materialised, by the provision of a rapid train service between industrial and commercial centres. As has been proved in many of the leading Continental countries and in the United States of America, business people to whom considerations of time are all-important, and others who can afford to pay substantially

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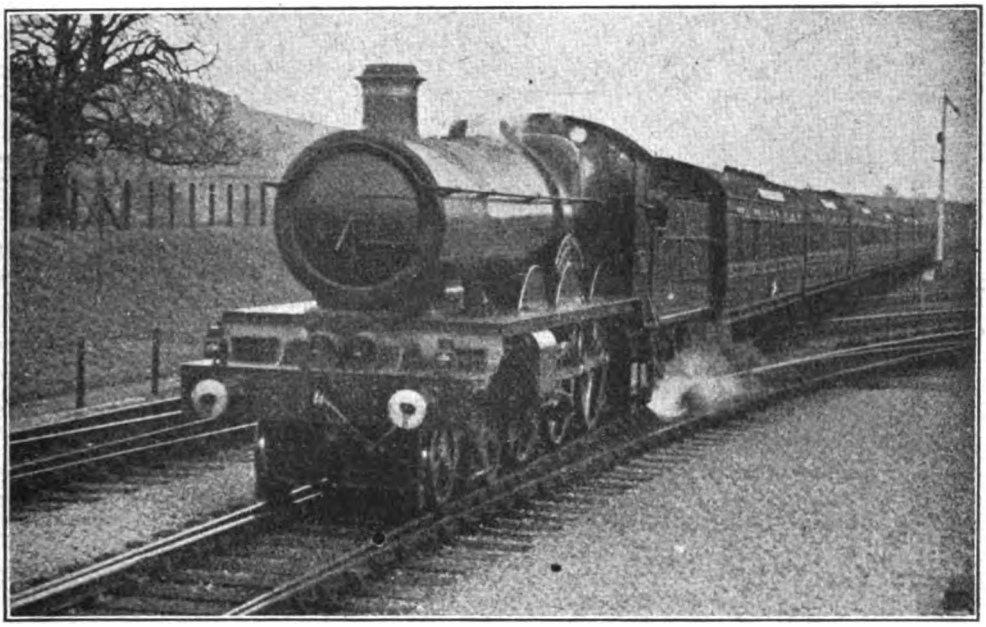
for rapid and luxurious travel, might be catered for by the institution of a small number of "limited" express trains on the principal trade and holiday routes of the country.

With the developments of locomotive power now at command, provided the loads of the trains concerned were reasonably limited, it would probably be practicable to run them over all the leading main lines of the country at average speeds up to the mile-a-minute rate, or even higher in some cases. For example, Birmingham might be reached from London in 1¾ hours by both Leeds, and 16s. 6d. to Edinburgh or Glasgow. For the sake of punctuality in operation, the *Trains de Luxe* would be strictly limited in character, containing a fixed number of places capable of preliminary reservation, and both first and second class passengers would be conveyed, as it is doubtful whether, in these islands, a paying load of the former alone could be obtained over long distances. But I must not expend any more space on the subject, as these operative and commercial aspects of it lie really outside the province of these articles. I shall hope, however, to examine at greater detail in a



Photo] [*Raymond Walker.*

GREAT WESTERN RAILWAY.

11.0 a.m. express from Paddington passing Bathampton Junction at full speed.
4-cylinder 4–6–0 locomotive, No. 4044, *Prince George.*

Great Western and London and North Western Railways; Manchester in 3 hours by London and North Western Railway; Sheffield in 2¾ hours by either the Midland or the Great Central Railways; Leeds in 3 hours by Great Northern Railway; and Edinburgh and Glasgow in 7 hours by the East and West Coast routes respectively. The method of charging for the use of the limited expresses would be that of an additional levy per mile of, say, ½d., independent of class, amounting to an addition of about 4s. 7d. to the Birmingham fare, 7s. 10d. to Manchester, 6s. 7d. to Sheffield, 7s. 9d. to future issue the question of maximum speed possibilities in the same connection from the locomotive standpoint.

In the earlier part of the present article I drew attention to the exceptionally lavish character of the express train service between London and Birmingham prior to the war. A still more generous provision, however, was that made by the three companies competing for the Manchester–Liverpool traffic, between which cities no less than forty-nine 40-min. expresses, thirty-five 45-min. expresses, and seven other fast trains in 50 min. or less, ran every

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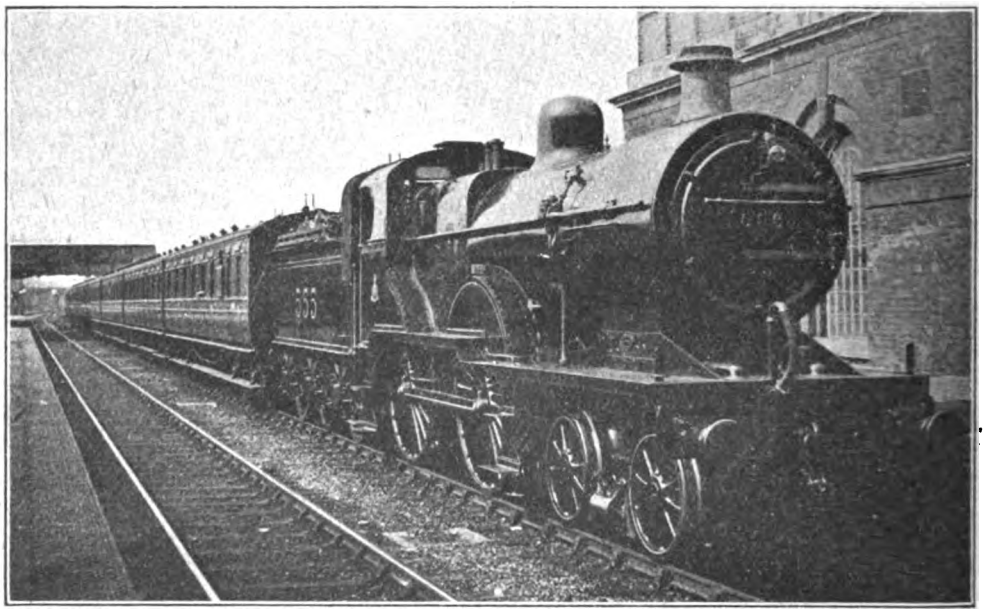
day. This was equivalent in total number to an express every 20 min. throughout the day in each direction from 7.30 a.m. to 9.30 p.m., over routes varying from 31⅜ miles in the case of the London and North Western Railway to 34 miles in that of the Cheshire Lines Committee, and as much as 37 miles by the Lancashire and Yorkshire line. Nevertheless the Lancashire and Yorkshire Company ran the largest number of 40-min. "fliers" in each direction, despite having also the most heavily graded route of all three. Early in the war the Lancashire and Yorkshire time was extended to 45 min., at which figure it still stands; recollect having described two runs in all in these columns.

There are no severe gradients on the Cheshire Lines route, the most noteworthy banks in the west-bound direction being the descent at 1 in 100 for ¾-mile and 1 in 132 for ⅜-mile from Manchester (Central) to Throstle Nest Junction, making an excellent start for west-bound trains; the 1⅛ miles' ascent at 1 in 135 to the bridge over the Ship Canal and the ¾-mile descent at the same inclination; 3½ miles up, mostly at 1 in 188-230, to Farnworth station, and 2¼ miles subsequent fall at 1 in 185; another 2¼ miles up at the same grade immediately



Photo] [*F. H. Stingemore.*

MIDLAND RAILWAY.

Superheater rebuilt 4–4–0 engine, No. 555, on an up stopping train at Radlett.

most of the fast London and North Western trains disappeared or were considerably slackened not long afterwards, and now, finally, the Cheshire Lines Committee has been compelled to increase the time of its famous hourly "Punctual" expresses, as from January 1st last, to 50 min. I have details, however, of a number of journeys on all three routes timed a short time before the decelerations came into effect, and I desire to deal with some of these runs in the present issue. The opportunity is the more welcome in the case of the Cheshire Lines Committee, over which route I can only

following to Hunt's Cross, with 1¼ miles down at 1 in 195 to Garston; and, finally, ⅜-mile up at 1 in 109 out of Liverpool (Central) which, being situated in tunnel, makes the immediate start for east-bound trains as difficult as that for west-bound trains out of Manchester is favourable. Good starts are obtainable from Warrington, there being a mile down in each direction at 1 in 180–258 to Padgate and Sankey Junctions, where the direct line avoiding Warrington is joined. As regards the times of the hourly expresses, west-bound trains were given the almost impossible allowance

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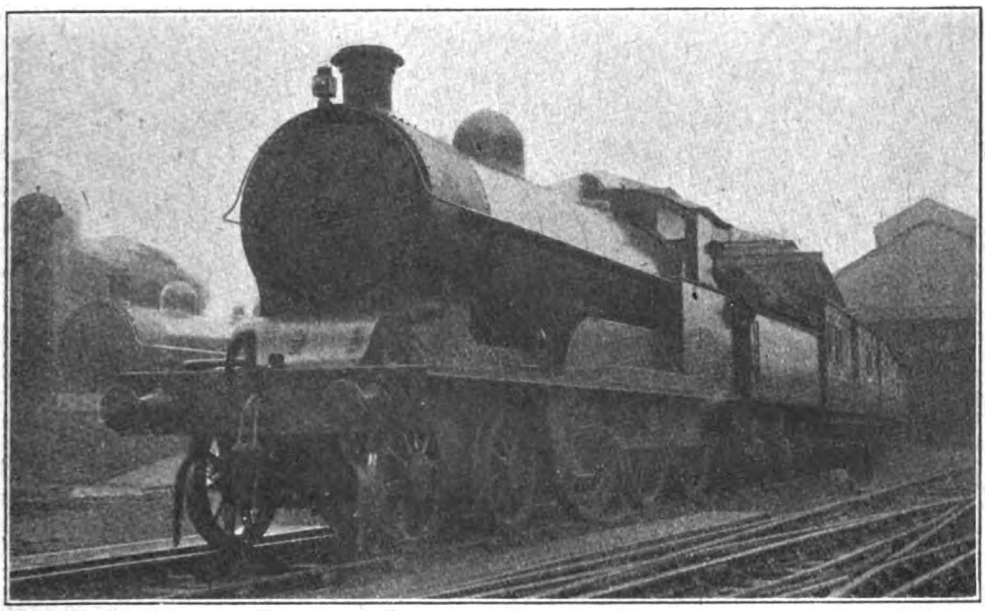
of 18 min. for the 15·7 miles to Warrington, but an easy timing of 25 min. for the 18·4 miles thence to Liverpool, making, with a 2 min. stop at Warrington, 45 min. in all. From January 1st the Manchester–Warrington time is increased by 4 min., and the Warrington–Liverpool allowance by 1 min. On the east-bound journey the allowance was 23 min. from Liverpool to Warrington and 20 min. thence to Manchester, with a stop of 2 min., now increased to 26 and 21 min. respectively with a 3-min. halt.

The service is at present operated mainly by the Pollitt 4–4–0 engines of the Great Central Railway, most of which have now been equipped with superheaters by Mr. Robinson. With the standard 5-coach formations of the heavy new coaches no difficulty is experienced in time-keeping. For example, No. 855 of the above-mentioned type, on the 6.30 p.m. *ex*-Liverpool, with 5 "eights" of the Great Central stock and a 6-wheeler, or 165 tons with passengers, passed Mersey Road, 4 miles, in 6 min. 40 sec.; Hunt's Cross, 7·1 miles, in 10 min. 35 sec.; Farnworth, 12·3 miles, in 16 min. 10 sec.; Sankey Junction, 17·3 miles, in 21 min., and reached Warrington in 22 min. 50 sec. Maximum speeds were 52 m.p.h. at Mersey Road, 64½ at Halewood and 68 at Sankey, while the minima were 45 m.p.h. at Hunt's Cross and 53 at Farnworth. From Warrington we passed Padgate, 1·8 miles, in 3 min. 35 sec.; Irlam, 7·3 miles, in 9 min. 40 sec.; Trafford Park, 12·5 miles, in 15 min. 5 sec.; and reached Manchester in 19 min. 40 sec., touching 57 m.p.h. at Glazebrook and 64 at Flixton, and falling to 51 m.p.h. at the Ship Canal. Overall time was 44 min. 40 sec., and actual running time 42 min. 20 sec. This run in its intermediate times and speeds may be taken as an average performance, and but little description is needed of other very similar journeys. On the 8.30 p.m. No. 858 of the same type had a 6-coach train of the Great Northern stock, again weighing 165 tons full. So loaded, we passed Hunt's Cross in 10 min. 20 sec.; Farnworth in 16 min.; and reached Warrington in 22 min. 55 sec.; net time was 22 min. 40 sec., as there was a slight signal check at Hunt's Cross. From Warrington we passed Irlam in 9 min. 40 sec.; Trafford Park in 15 min. 5 sec.; and reached Manchester, after a permanent way check, in 20 min. 20 sec., or 19 min. 40 sec. net. In this case the overall time was 45 min. 55 sec., and the net running time 42 min. 20 sec., as before. On another run with a 6-coach Great Central train, or 180 tons,



Photo] [*W. H. C. Kelland.*

LONDON AND NORTH WESTERN RAILWAY.

"Experiment" class 4–6–0 locomotive, No. 1689, *Monmouthshire*, at Carnforth.

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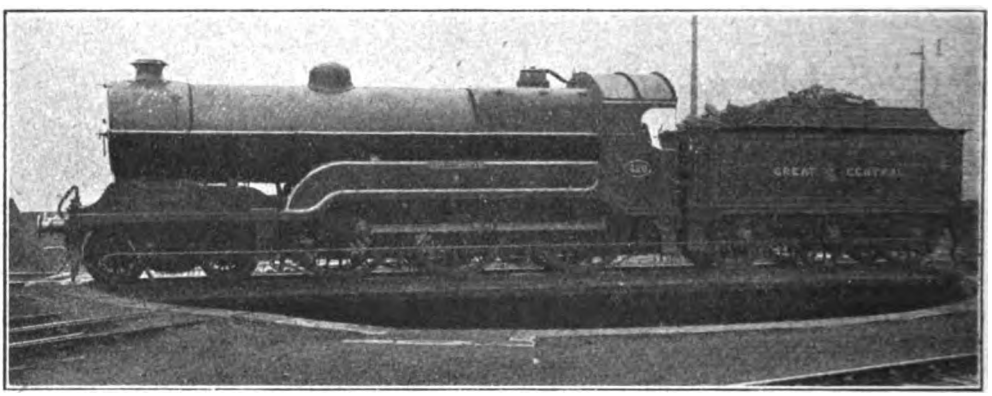
and No. 873, Hunt's Cross was passed in 10½ min., and Farnworth in 16 min., while it took 23 min. 10 sec. to reach Warrington, in virtue of a slow finish. From Warrington we were through Irlam in 10 min., and Trafford Park in 15 min. 35 sec., again suffering a permanent way check and so occupying 20 min. 25 sec. to the stop at Manchester, or about 20 min. 5 sec. net. On this journey overall time was 45 min. 55 sec., and net running time about 43¼ min., or nearly a minute more than on the last two runs.

But the more heavily loaded trains presented decided difficulties in the way of time-keeping, the 9.30 p.m. *ex*-Liverpool, with through carriages and vans for both the Great Central and Great Northern lines, being a particularly hard train to work; Warrington in 23 min. exactly. The speed at Sankey was high on this run, touching as it did 71½ m.p.h. From Warrington we were through Padgate in 3¾ min., Irlam in 10¼ min., Trafford Park in 15 min. 55 sec., and into Manchester in 20 min. 20 sec., having occupied 46 min. 25 sec. overall, and 43 min. 20 sec. running time. But No. 1040, of the same type, was unable to haul a 39-axle load of 270 tons to schedule, as on the occasion in question we took 11 min. 40 sec. to Hunt's Cross, 17 min. 20 sec. to Farnworth, and 24 min. 20 sec. to Warrington; from Warrington the times were 10 min. 25 sec. to Irlam, 15 min. 55 sec. to Trafford Park, and 21 min. to Manchester, or 20½ min. net. The totals on this run were 48 min. 25 sec. overall, and 44 min. 50 sec. net running time.



Photo] [*W. H. Whitworth.*

GREAT CENTRAL RAILWAY.

4–6–0 superheater locomotive, No. 426, *City of Chester* ("Sir Sam Fay" type), at Manchester Central station.

with this express I have a number of records. No. 1022, one of the earlier Robinson 4–4–0's, not superheated, hauled a train of 32 axles, or 210 tons, and passed Hunt's Cross in 10 min. 20 sec., and Farnworth in 15 min. 40 sec., reaching Warrington in the good time of 22 min. 20 sec., in virtue of a sustained top speed of 67 m.p.h. beyond Sankey. But from Warrington the work was unaccountably poor, as we took 22 min. 5 sec. to reach Manchester, making an overall time of 47 min. 20 sec., and a running time of 44¾ min. A minute overtime was spent at Warrington, as is customary with this train. Shortly afterwards No. 1022 had 225 tons to haul, by the addition of a 6-wheeler to the last-mentioned load, and passed Hunt's Cross in 10 min. 40 sec., and Farnworth in 16 min. 10 sec., reaching

Reverting to the small 4–4–0 superheater engines. I will describe some further runs on the 9.30 p.m. east-bound express under the same conditions of loading. No. 268 had to tackle 260 tons (nine 8-wheelers and a 6-wheeler), and took 11¾ min. to Hunt's Cross (of which 15 sec. may be credited to a permanent way check at Brunswick), 17 min. 40 sec. to Farnworth, and 25 min. to Warrington, or 24¾ min. net. Speed only rose to 61 m.p.h. at both Halewood and Sankey. From Warrington Irlam was breasted in 10 min. 50 sec. and Trafford Park in 17 min., Manchester being reached in 21 min. 55 sec., or 21 min. 35 sec. net, as the same permanent way relaying check as previously was experienced near Trafford Park Junction. The gross time of the journey was 50 min., less 5 sec., and the net running

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time 46 min. 20 sec. No. 874 failed similarly on the 8.30 p.m. *ex*-Liverpool, on which, for some special occasion, nine 8-wheelers of the large Great Central stock, packed with passengers, and an additional 8-wheeled van, were run, totalling 279 tons empty and fully 300 tons with passengers. In these circumstances it took 11 min. 25 sec. to get through Hunt's Cross, 17 min. 40 sec. to Farnworth, where the speed fell to 47 m.p.h., and 25 min. exactly to Warrington, while from Warrington Irlam was passed in 10 min. 50 sec., Trafford Park in 16 min. 55 sec., and Manchester was reached in 22 min., the stop being made very slowly. Drawing up twice at Warrington caused the stop there to occupy 5 min.; the overall time of the journey was 52 min. 10 sec., and the running time 47 min. On my most recent journey we had the same engine and a still further increased load of 43 axles, or 305 tons, and ran in much the same times, except for extra loss of time through an awkward permanent way slack at Hough Green; to Hunt's Cross we took 11 min. 50 sec., to Farnworth 22¾ min., and to Warrington 26 min. 25 sec., or 25½ min. net. Out of Warrington the times were 11 min. 5 sec. to Irlam, 17 min. 5 sec. to Trafford Park, and 22 min. to Manchester, total 52¾ min. overall and 47½ min. net running time. One could not call such running bad, as these small engines were very much overloaded on such sharp bookings.

My best runs by far in this direction were the two described in the January issue of last year, which were both made on the same express from Liverpool. No. 872, small superheater 4–4–0, with 38 axles, or 265 tons, passed Mersey Road in 7 min. 10 sec., Hunt's Cross in 10 min. 50 sec., Farnworth in 16¼ min., and Sankey Junction in 21 min. 10 sec., reaching Warrington in 23 min. 10 sec., the maximum speeds at Halewood and Sankey being 66 and 69 m.p.h. respectively, and the minimum at Farnworth 53½ m.p.h. From Warrington Padgate was passed in 3 min. 55 sec., Irlam in 10 min. 10 sec., Trafford Park in 15 min. 35 sec., and Manchester was reached in 20 min. 10 sec. On this length speed rose to 57 m.p.h. at Glazebrook and 64 at Flixton, and only fell to 51 m.p.h. over the Ship Canal. So, although the overall time was 47¾ min., the actual running time of 43 min. 20 sec. showed an excess of 20 sec. only on schedule, which was a most creditable achievement on the part of the engine. On the other journey No. 1022, which has figured in previous runs, had a heavier load of 280 tons, and ran exactly 5 sec. behind the times of 872 as far as Hunt's Cross, but thereafter did some fine work, passing Farnworth in 16 min. 5 sec., Sankey Junction in 20 min. 50 sec., and reaching Warrington in 22¾ min. At Mersey Road we were doing 52½ m.p.h., and at Hunt's Cross the minimum rate was 47½ m.p.h., while, between maxima of 68 m.p.h. at Halewood and 70 at Sankey, no lower rate than 56 m.p.h. was registered at Farnworth. From Warrington Padgate was passed in 4 min., Irlam in 10 min., Trafford Park in 15 min. 20 sec., and Manchester was reached in 19 min. 50 sec., the engine having thus gained in all 25 sec. on schedule, despite the fact that the overall time was 47 min. 10 sec. We touched 58½ m.p.h. at Glazebrook, 64 at Flixton and 60 at Throstle Nest Junction, and only fell to 52 m.p.h. at the Ship Canal bridge. This is, I think, the finest run I have yet timed on the Cheshire Lines system.

In the west-bound direction, which provides the easier running, my journeys have been chiefly with 5-coach trains on the 7.30 and 8.30 p.m. expresses *ex*-Manchester. No. 853, superheater, with a Gorton-built train of 150 tons, full, passed Trafford Park, 3·2 miles, in 5 min. 10 sec., Irlam, 8·4 miles, in 10 min. 35 sec., and Padgate, 13·9 miles, in 15 min. 50 sec., Warrington being reached in 18 min. 40 sec.—the nearest to schedule time that I have recorded for this 15·7 miles' run, and a smart piece of work. Speed touched 62½ m.p.h. at Flixton, only fell to 55 over the Ship Canal, and was sustained at 64½ before Padgate. After Warrington we passed Farnworth, 6·1 miles, in 8 min. 50 sec., at 45½ m.p.h.; Hunt's Cross, 11·3 miles, in 14 min. 20 sec., at 52 m.p.h., with an intervening maximum of 64½ at Halewood; Mersey Road, 14·4 miles, in 17 min. 25 sec., again at 64½ m.p.h.; and reached Liverpool, after the customary very slow finish, in 23 min. 10 sec. Running times therefore aggregated 41 min. 50 sec., or 70 sec. under schedule, and overall time was 44¼ min. No. 870, with the same load, was badly checked for permanent way repairs before Trafford Park, taking 5 min. 40 sec. to that station, but recovered to 60 m.p.h. at Flixton, topped the bridge at 52 and passed Irlam in 11½ min., then sustained 65 m.p.h. before Padgate, passing Padgate in 16¾ min., and reached Warrington in 19¼ min., or not over 18¼ min. net, which represents even better work than the last journey. So also was the second stage, as we passed

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Farnworth in 8 min. 40 sec. from Warrington, Hunt's Cross in 13 min. 50 sec., and Mersey Road in 17 min., speed rising to 67 m.p.h. at Halewood and 64 at Garston, with minima of 46½ m.p.h. at Farnworth and 52 at Hunt's Cross. The end of the run was delayed by a further permanent way relaying check at Brunswick, but we arrived in Liverpool 23 min. 55 sec. after leaving Warrington, or 22¾ min. net. Net running times on this journey therefore totalled 41 min., or a full 2 min. under schedule, while the gross time was 45 min. 40 sec. These are my two best timings in this direction of running, the others being more or less commonplace.

With a slightly increased load of 160 tons, No. 866 passed Trafford Park in 5 min. 10 sec., Irlam in 10 min. 40 sec., and Padgate in 16 min. 40 sec., reaching Warrington in 19 min. 10 sec. After Warrington the times were 9 min. to Farnworth, 14 min. 35 sec. to Hunt's Cross, and 24 min. into Liverpool, making a total running time of 43 min. 10 sec., and an overall time of 5 sec. under schedule. The heaviest load I have noted in this direction of running was one of eight of the large Great Central 8-wheelers, crammed with passengers (this was at the time when the Royal Agricultural Show was being held at Alexandra Park) and a 4-wheeler, the gross load being fully 255 tons. Matters were complicated by a permanent way slack at Trafford Park Junction, so that we took 5 min. 50 sec. to pass Trafford Park, and 11 min. 50 sec. to Irlam; however, Padgate was passed in 17½ min., and Warrington was reached in 20 min. exactly, or 19 min. 20 sec. net. From Warrington we did splendidly, passing Farnworth in 9 min. 25 sec., at 47½ m.p.h.; accelerating to 66 m.p.h. at Halewood and getting through Hunt's Cross in 14 min. 55 sec., at 49 m.p.h.; while a final maximum of 62½ m.p.h. took us through Mersey Road in 18 min., and into Liverpool in 23 min. 40 sec., 80 sec. under schedule. Net running times therefore added up exactly to the schedule figure of 43 min., which was a fine achievement in the circumstances; aggregate time was 48 min. 40 sec., in view of overtime spent at Warrington.

The remaining three runs were on the 7.30 p.m. express, and the engine was in each case one of the Robinson 4-4-0's, but the work was inclined to be poor. No. 1013, with 160 tons, observed the Trafford Park caution rigorously, and took 12 min. 20 sec. to Irlam, 17¾ min. to Padgate, and 20 min. 10 sec. (19 min. net) to Warrington. From Warrington Farnworth was passed in 9 min. 20 sec., Hunt's Cross in 14 min. 50 sec., and Liverpool was reached in 24 min. 25 sec., total 43½ min. net running time, and 47 min. 55 sec. overall. No. 1022, hauling 170 tons, and suffering the same inaugural permanent way caution, passed Irlam in 12 min., and Padgate in 17 min. 40 sec., reaching Warrington in 20 min. 20 sec., or 19 min. 10 sec. net. Re-starting, we passed Farnworth in 9 min. 40 sec., Hunt's Cross in 15½ min., and were in Liverpool in 22 min. 50 sec., representing a total running time of 42 min. Overall time was 45 min. 40 sec. On a final run with the same engine and load, a slight signal check was experienced at Cornbrook Junction, but the running thence to Warrington was feeble, the time to Trafford Park being 5½ min., to Irlam 11 min. 40 sec., to Padgate 17 min. 35 sec., and to Warrington 19 min. 55 sec., or 19 min. 35 sec. net. After Warrington, however, there was a great improvement, as we breasted Farnworth in 8¾ min., touched 67 m.p.h. at Halewood, were through Hunt's Cross in 14 min., and reached Liverpool, 18·4 miles, in 22 min. 25 sec.—a gain of nearly 2½ min. on schedule. Total running time in this case was therefore again 42 min.; gross time was exactly 45 min. These few runs in each direction will serve to show that good and consistent work is being put in by Great Central locomotives on the Cheshire Lines Committee's system.

I had intended to describe a series of journeys on the competing Lancashire and Yorkshire route, but the limitations of space which so often curtail proposed programmes compel me to confine myself, in conclusion, to a couple of excellent trips by London and North Western Railway from Liverpool to Manchester. The North Western route is the easiest of the three, both in point of distance and grading, and in the working time-books the 40 min. non-stop trains were actually shown to complete the journey in 38 min. On the 6 p.m. *ex*-Lime Street, a 4-4-0 "Precursor," No. 2584, had a load of six small 8-wheelers, totalling 155 tons behind the tender. The steep incline to Edge Hill—1⅛ miles at 1 in 88—was breasted in 4 min. 25 sec., but then we were badly checked by signal; however, speed rapidly recovered on the level to 66 m.p.h. beyond Huyton, which was passed in exactly 10 min. (5¾ miles). On the 1⅛ miles at 1 in 96 up to Rainhill the rate fell to 55½ m.p.h., but the subsequent short descent to St.

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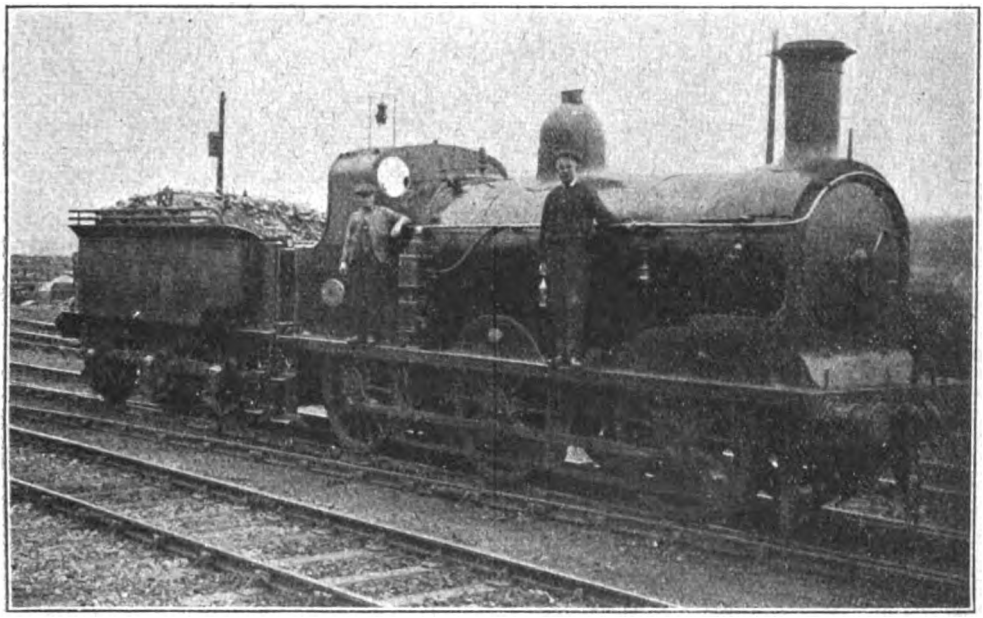
Helen's Junction—1½ miles at 1 in 89—produced a maximum rate of 79 m.p.h. So Rainhill, 9 miles, was passed in 13¼ min., and St. Helen's Junction, 12 miles, in 15 min. 55 sec. Then, unfortunately, we were checked by signal at Earlestown Junction, although despite this the 6⅞ miles from St. Helen's to Kenyon Junction only occupied 7 min.; after that speed rose on the level over Chat Moss to a sustained 68 m.p.h., the 8¾ miles from Kenyon Junction to Eccles taking 7¾ min., and the final 3¾ miles into Manchester, with a very slow finish, 5 min. 50 sec. This made the total time for the 31⅜ miles' journey 36½ min., but the net time certainly did not exceed 34 min., representing a clear gain of 4 min. on schedule.

My other run was on the 4 p.m. train, carrying a heavier load of 7 large corridor cars, or 225 tons, and booked to call at Edge Hill, with an increased allowance of 2 min. only in the total time; the engine in this case was a 4-6-0 "Prince of Wales," No. 2213, *Charles Kingsley*. From Lime Street up to Edge Hill took 4 min. 20 sec., start-to-stop. Thence we attained 59 m.p.h. beyond Huyton, fell to 47 at Rainhill, and accelerated to 72½ m.p.h. at St. Helen's; the subsequent speed, after a brief fall to 68 m.p.h at Kenyon Junction, was a sustained 70 m.p.h., until the engine was decidedly eased at about Astley. So from Edge Hill Huyton, 4⅜ miles, was passed in 6½ min.; Rainhill, 7⅝ miles, in 10 min. 5 sec.; Earlestown Junction, 13½ miles, in 15 min. 35 sec.; Kenyon Junction, 17½ miles, in 19 min. 10 sec.; and Eccles, 26¼ miles, in the smart time of 27¼ min. (the 18⅜ miles from Rainhill to Eccles having occupied 17 min. 10 sec.), and we reached Exchange station, exactly 30 miles from Edge Hill, in 32 min. 20 sec., instead of 35 min., as scheduled. Indeed, inclusive of the Edge Hill stop, the total journey time from Lime Street to Exchange was one of 38 min. 35 sec only—an excellent piece of work.



Photo] [*Frank Bell.*

NORTH BRITISH RAILWAY.

Drummond 0-6-0 goods engine, No. 458, rebuilt with Holmes' cab.

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Retirement of a Notable Railway Officer.

MR. ALFRED ASLETT, J.P.

Secretary and General Manager, Furness Railway Company, 1895 to 1918.

WE regret to announce that Mr. Alfred Aslett has, by his own desire, relinquished the position of Secretary and General Manager of the Furness Railway and will not take an active part in either the Secretarial or General Manager's Departments after April next.

Mr. Aslett has had a long career in the railway service, and his retirement will, we feel sure, be greatly regretted not only in the railway world generally but also in the various portions of the country where he has done such service for traders and the public. He was born at York on July 3rd, 1847, where his father then resided as District Superintendent of the Great Northern Railway, and afterwards occupied a similar position at Peterborough, prior to these appointments having been Secretary to Mr. George Hudson, "The Railway King." Educated in his native city, York, and also at Peterborough Grammar School, he was last year selected as the President of the Old Boys' Association of Peterborough King's School—"Old Petriburgians." Mr. Aslett commenced his railway career at Nottingham Goods, on the Great Northern Railway, in August, 1862, and for several years was a member of the celebrated Nottingham Robin Hood Rifles. Ten years later he was transferred to the Great Northern Railway Audit Office, King's Cross, and in 1881 was appointed Chief Accountant of the Eastern and Midlands Railway in Norfolk—now known as the Midland and Great Northern Joint Railway—with headquarters at King's Lynn, and in 1884 became Manager of that line. In 1891 he succeeded the late Mr. John Conacher as Secretary and General Manager of the Cambrian Railways. During the period—1884 to 1891—he did great service for the Eastern and Midlands Railway in connection with the King's Lynn, Norwich and Yarmouth goods and fish traffic, and also in the development of the passenger traffic in competition with the Great Eastern Railway.

MR. ALFRED ASLETT, J.P.

After being four years with the Cambrian Railways—during which period, 1891-1895, there was a great development of the passenger traffic on that line—he was offered and accepted in July, 1895, the post of General Manager on the Furness Railway in succession to the late Sir James Ramsden, then Managing Director.

On his retirement from the Cambrian Railway's service he was presented by the town of Aberystwyth with a magnificent bronze Japanese lamp on a pedestal as a mark of their esteem. It must have been very gratifying for an Englishman to receive such a token of

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respect from the northern section of the Welsh people.

In the months of October, November and December, 1911, and January, 1912, Mr. Aslett visited India and Egypt for the purpose of seeing the working of the Indian and Egyptian Railways and attending the Coronation Durbar at Delhi.

For a period of four years, from February, 1908, to February, 1912, Mr. Aslett was President of the Barrow Chamber of Commerce. As the representative of that Chamber, he crossed the Atlantic in September, 1912, and attended the Fifth International Congress of Chambers of Commerce held at Boston (Mass.). To commemorate these visits to the East and West, Mr. Aslett entertained at the Furness Abbey Hotel on January 30th, 1913, a party of about sixty gentlemen, members of the Barrow and other Chambers of Commerce, and gave an interesting account of his foreign travels, the American portion of which represented a total distance of about 10,000 miles, which added to the 20,000 miles to and from the East, represented about 30,000 miles in a little over twelve months.

Mr. Aslett has been a Freemason for many years, and is a Past Provincial Grand Warden of West Lancashire. He is a Justice of the Peace for the Borough of Barrow-in-Furness and Chairman of the Furness and Barrow Branch of the Royal Society for the Prevention of Cruelty to Animals.

He resides at Stanyan Lodge, Ulverston, and is a member of the County Club, Barrow-in-Furness, the North Lonsdale Club, Ulverston, and the National Liberal Club, London.

Always an ardent cricketer, Mr. Aslett is President of the Barrow Cricket Club. He possesses a cricket ball mounted on a silver stand, on which is inscribed: "G.N.R. Married *v.* Single, 1874, Hitchin, 4 Wickets with 4 Successive Balls."

During Mr. Aslett's connection with the Midland and Great Northern Joint, Cambrian and Furness Railways he has been instrumental in arranging for the officers and salaried members of the staffs of these companies to be associated with the Railway Clearing System Superannuation Fund Corporation, and for exceptional benefits to the Furness staff by the guarantee of the scale of "fiftieths" on the average salary of the last seven years.

During Mr. Aslett's association with the Furness Railway many great problems have had to be dealt with in connection with the Naval Construction and Armaments Co., Messrs. Vickers, Ltd., Barrow H. Steel Co., North Lonsdale Iron and Steel Co., Millom and Askam Hematite Iron Co., Workington Iron and Steel Co., and also many other important industries and traders on the Furness Railway line.

Although primarily a goods traffic man, Mr. Aslett, as in the case of the Cambrian Railways, has developed the passenger traffic on the Furness Railway to a remarkable extent, the figures from 1895 to 1913—the year before the War—showing the very large increase in passengers of about two and a half millions =102 per cent., and in the gross receipts £73,000 =65 per cent., the net profit representing an increase of £43,500, *i.e.*, more than 1½ per cent. dividend on the Ordinary Stock.

Mr. Aslett has before retirement had the pleasure of seeing the important system of train control working successfully introduced on the Furness Railway.

The War traffic has naturally thrown a large amount of additional work on the Secretary and General Manager of the Furness Railway, who has, fortunately, been associated during this exceptionally trying period with officers who have been exceedingly loyal to him in all respects, and the same may be said during the 23 years he has been associated with the Furness Railway, which equally applies to the staff generally, including the stevedore on the Barrow Docks. It will be a source of profound regret to Mr. Aslett to say "adieu" to the officers and staff and all these pleasant associations.

Mr. Aslett will, we feel sure, take with him from all the traders and the public generally the most sincere feelings of regret at the severance of his railway associations and interests in the Barrow and Furness district.

His nephew, Mr. Alfred H. Aslett, is the Deputy Chief Engineer of the East Indian Railway, Calcutta.

In the year 1877 Mr. Aslett married Emma Mary, the only daughter of the late Edward Francis Rimbault, LL.D.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

Gradients and Service Slacks, London and North Western Main Line.

Principal gradients between Rugby and Liverpool are inconsiderable, there being nothing steeper than 1 in 300 between Rugby and Acton Bridge, 90 miles, save the descent from Whitmore to Crewe, which is at 1 in 177 for 3 miles from Madeley station, and 1 in 250 for 2¼ miles beyond. Generally speaking, the line rises slightly from Rugby to Shilton, falls thence to Tamworth with 3½ miles at 1 in 330 from Bulkington to Nuneaton, and 2¼ at 1 in 300 past Atherstone, rises at 1 in 330 for 3¼ miles to Lichfield, and undulates thence to Stafford, after which there is a gentle continuous ascent to Whitmore and a sharp fall into Crewe. From Crewe there is a gentle fall to Weaver Junction, a steeper rise to Sutton Weaver and subsequent fall to Ditton Junction, whence the line rises into Edge Hill and falls at 1 in 88 for 1⅞ miles into Lime Street station. Chief service slacks on this length are 40 m.p.h. at Trent Valley Junction, and a varying reduction at Crewe, in the case of any train not stopping there, according as to whether it passes through the station, or outside by the avoiding line.

[Reply to "LIVERPUDLIAN."]

Possibilities in Non-Stop Runs.

You can hardly expect an authoritative answer to a question such as yours as to how far a modern 4-6-0 express locomotive burning oil fuel could pull a 350-ton train over a moderately level road without intermediate stoppage, provided the supply of fuel was unlimited, water could be taken where necessary, and enginemen could be changed *en route*. Mechanically, a locomotive should be able to remain in continuous working for as long a period as any other form of steam engine, except for the fact that its mechanism is exposed to greater stresses than that of a stationary engine owing to the fact that it is continuously in motion over a surface which, on the best laid and maintained of lines, is by no means perfectly even. The longest run on record was between Euston and Carlisle, London and North Western Railway, 299 miles, which has been accomplished non-stop on three occasions, twice down and once up.

[Reply to "G. S. & W. R."]

Midland Railway 4-6-4 Tank Engines.

After the absorption of the London, Tilbury and Southend Railway by the Midland Company, these engines (which, as you rightly surmise, were too heavy for certain of the underline bridgework between Gas Factory Junction and Fenchurch Street) were tried on passenger trains on various parts of the Midland system, more particularly in the neighbourhood of Bristol But apparently they did not meet with success in these duties, as, after a brief return to the London, Tilbury and Southend section, they were transferred to the haulage of heavy coal trains between Wellingborough and Brent Sidings, on which they are now engaged. The Midland locomotive authorities apparently consider this the most suitable type of service for them.

[Reply to J. P. T.]

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Joint Line Locomotive Working.

In pre-war times, to which we assume you refer, slow trains on the Great Northern and Great Eastern Joint Line were worked for the most part by the Great Northern Company north of Spalding, and by the Great Eastern Railway south of that point, but the latter company was responsible for the working of one or two slow trains to and from Doncaster, in addition to the whole of the expresses. On the Swinton and Knottingley (Midland and North Eastern) Joint Line, the bulk of the passenger trains were Midland-operated, but the North Eastern Company worked certain trains into and out of Sheffield by this route, and the Great Central used it for its passenger service from York to the South as far as Mexborough West Junction.

[Reply to M. A. OLDHAM.]

Largest Railway Stations.

Waterloo station of the London and South Western Railway will, when completed, be the largest station in the United Kingdom, with 21 platforms, and a total area of 24½ acres. Clapham Junction, of the London and South Western and London, Brighton and South Coast Railways, deals with the most trains daily, *i.e.*, 1,130 of the former company and 600 of the latter, total 1,730; the acreage covered in this case totals 24¼, with an additional 10½ acres of sidings. But we imagine that, if goods accommodation be included, the palm must go to Crewe, London and North Western Railway, which, in addition to its large passenger station, has nests of sidings extending for well over 2 miles adjacent to the main line.

[Reply to "MAC" and FRANK FLINT.]

Cambrian Railway Gradients.

From Moat Lane Junction, or from Caersws, to Talerddig Summit the rate of ascent varies mostly from 1 in 211 to 1 in 71, the steepest portions being the ½-mile at the latter figure up to Pontdolgoch station, the ¾-mile at 1 in 100 between mile-posts 56½ and 57¼ (from Whitchurch), and the final ¾-mile at 1 in 80 to the summit. But the subsequent descent is far steeper, as it drops continuously thence to Llanbrynmair, 3¼ miles at 1 in 53, while for the next 9 miles—to a point 1¼ miles east of Machynlleth, the fall continues steeply, first for ¾-mile at 1 in 60-65, and then mostly at 1 in 90 to 1 in 163. This is a difficult piece of road to negotiate.

[Reply to G. A. BURGOYNE.]

Rail Lengths, East Coast Route.

The Great Northern main line is laid principally with 36 ft. and 45 ft. rails, but considerable lengths of 30 ft. rails remain in use, and there are a few short lengths of 60 ft. rails recently laid, which were rolled in the London and North Western Company's works at Crewe. On the North Eastern Railway the lengths are 30 ft. and 45 ft., fairly equally divided. The North British main line between Berwick and Edinburgh is laid mostly with 40 ft. rails, but a commencement has been made with the installation of 48 ft. rails when relaying is carried out, while there are a few lengths of 24 ft. rails that have not yet been taken out.

[Reply to R. A. C.]

Wheel-Loads, British and American.

Limit of wheel-loading in general in this country may be taken at 10 tons, there being only one British locomotive type—the 4–4–0 R1 class of the North Eastern Railway—in which this amount is exceeded, in virtue of a total weight of 42 tons on the four coupled wheels. In America, however, wheel-loads up to 15 tons are by no means uncommon; indeed, the latest 4–4–4 express engine of the Philadelphia and Reading Railroad, built to haul the Atlantic City "fliers," has no less than 65 tons on the coupled wheels, amounting to 16¼ tons on each wheel.

[Reply to R. D. G. G.]

Great Central Express Locomotives.

It is quite impossible to determine, other than by actual trial, the kind of performance that the engines of one company would put up on the metals of another, but we have no reason to doubt that the large 4–4–0 and 4–6–0 engines of the Great Central Railway would acquit themselves well if tried on the London and North Western Railway. Engines of the 4–6–0 "Sir Sam Fay" class take their turn in working express passenger trains on the Great Central Railway, but normally are not often so employed south of Nottingham.

[Reply to "GREAT CENTRAL."]

"Slow" Lines between Stafford and Crewe, London and North Western Railway.

Passenger trains are diverted to the slow lines between Stafford and Crewe when necessary for the expeditious working of traffic. Certain expresses are, or used to be, booked regularly to run thus, in order that they might be overtaken by quicker trains

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using the fast lines. It would be better, perhaps, to call the former "Relief" lines, instead of "slow" lines, as is the practice on the Great Western Railway, seeing that this designation more accurately indicates their character.

[Reply to HERBERT NEAL.]

Superheater "Atlantic" Locomotives, Great Northern Railway.

The distinguishing feature of the superheated "Atlantics" on the Great Northern Railway, as compared with those not so equipped, is that in the former the chimney is exactly in the centre of the smokebox, instead of being set back somewhat toward the cab, while behind the chimney are located the snifter valves, which project through the top of the smokebox, or, in more recent engines, are encased in a mushroom head. Your other questions are dealt with in "What the Railways are Doing."

[Reply to H. A. WHITE.]

North London Railway Coaches.

Withdrawal of the Broad Street–Chalk Farm train service, and the substitution of electric for steam traction on the Broad Street–Richmond (Outer Circle) route have released a number of North London passenger coaches, which are now being utilised as convenient by the London and North Western Railway in the way you mention. Recently a RAILWAY MAGAZINE reader wrote saying that he had seen an ambulance train in France made up with some of the coaches in question.

[Reply to "SAFETY-VALVE."]

999 Class Engines, Midland Railway.

Deeley 4–4–0 simple engines of the 999 class were experimental in character, and as the compounds have proved the more suitable type of the two for the general work of the Midland system, the reason for there being 45 of the latter as against 10 only of the former is very simply explained. The 999 class locomotives have proved the most successful in working on the hilly northern section of the Midland main line, and so work principally between Leeds and Carlisle.

[Reply to "STEAM GAUGE."]

North London Railway Running Powers.

Arrangements of statutory running powers are frequently mutual in character, and in exchange for the powers which the North London Company enjoys over the Great Northern Railway from Canonbury Junction to Cuffley, Potters Bar, High Barnet, Alexandra Palace and Edgware (the last-named alone not being exercised), the Great Northern Railway obtained direct access to the London Docks with its valuable merchandise traffic.

[Reply to "RIFLEMAN."]

British and American Locomotive Construction.

No book has been or could be produced at the price you mention dealing fully with so wide a subject as the principles and practice of British and American Locomotive Construction; a complete exposition of both topics might occupy volumes. As regards the *principles*, you cannot do better than purchase Vaughan Pendred's "The Railway Locomotive; What it is and why it is what it is," published at 6s. net.

[Reply to R. D. G. G.]

Some Brake Queries.

Brakes on bogie wheels, when fitted, are operated through the medium of the ordinary brake gear, and are not applied separately from those on the other wheels of the locomotive. In the case of two engines hauling a goods train, the leading engine cannot apply the brakes of the train engine unless both are equipped either with the Westinghouse or the Vacuum brake, and the flexible hose between them has been connected up.

[Reply to "BOGIE."]

Fastest Train on the London and North Western Railway.

Fastest start-to-stop schedule in the present public London and North Western time-tables is that of the 8.30 a.m. Irish boat express as between Willesden and Rugby, 77 miles in 84 min., equivalent to an average speed of 55 miles per hour. But why not secure a copy of Bradshaw's Guide, which gives the various mileages in addition to the times of the trains, and hunt up such details for yourself?

[Reply to J. MATHEWS.]

Great Southern and Western Railway Locomotives.

Mr. E. A. Watson's 4-cylinder 4–6–0 engine No. 400 on this railway has proved in every way successful, and doubtless the type will be multiplied as soon as conditions permit. We have no information as to the fitting of the 4–6–0 goods engines of the same company with superheaters.

[Reply to "G. S. &. W. R."]

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2-8-0 Engines, Somerset and Dorset Joint Railway.

Built at Derby, the "Consolidation" locomotives of the Somerset and Dorset Joint Railway commenced work on their own system in the early part of 1914. We are not aware of any special "system" of numbering engines on the Midland and Great Western Joint Railway.

[Reply to J. E. ROCKE.]

Firemen's Call Boxes.

Firemen's call boxes are provided at advanced starting signals in order to enable the firemen of trains stopped at these signals to communicate with the signalmen, in observance of Rule 55 (a), without walking back to the signal-box in order to do so.

[Reply to HERBERT NEAL.]

2-6-0 Locomotives, Great Western and Great Northern Railways.

"Mogul" locomotives of the Great Western and Great Northern Railways are in each case 2-cylinder engines, not 4-cylinder, and are all superheater-equipped, the former with the Swindon apparatus, and the latter with the Robinson superheater.

[Reply to N. C. SELWAY.]

Top-Feed Apparatus, Great Western Railway.

The pipes encircling the boilers of Great Western Railway engines, and terminating on either side of the safety valve casings, lead from the injectors to the top-feed apparatus, and are the means whereby the boiler is fed with water.

[Reply to P. E. COMPTON-SMITH.]

American Speed Records.

We saw the extract to which you refer, and there is no satisfactory authentication for the claims made. The mere fact that the distance is only given to the nearest ½-mile lays the "records" open to suspicion as regards their accuracy. [Reply to G. T. LADD.]

Safety Appliances for the Protection of Passengers.

The questions you raise are of very wide scope, and until sufficient data are available on which to form a judgment, it is not possible to pronounce as to the nature and extent of the protection which is warrantable, and as to its control.

[Reply to "BOM."]

Whetstone Junction.

This connects the Great Central main line and the London and North Western line from Leicester to Nuneaton. It is facing for down Great Central trains and for up London and North Western trains.

[Reply to H. ALEX. GOODWIN.]

London and North Western Railway Coaches.

The projecting "wings" on either side of the carriage doors to which you refer are for the more efficient prevention of draught inside the carriages.

[Reply to A. COCKING.]

Superheated Locomotives.

London and North Western Railway 4–6–2 type tank locomotives are superheated, those of the 4–4–2 type are not.

[Reply to J. HATHEW.]

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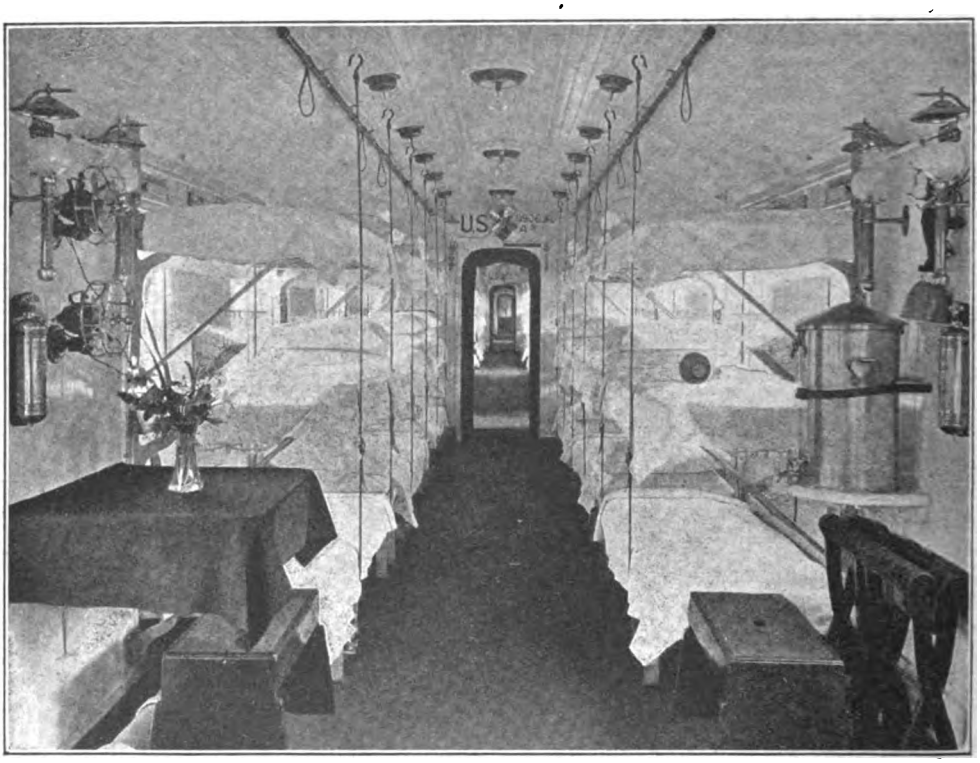
Lancashire and Yorkshire Railway.

AMBULANCE TRAIN FOR THE UNITED STATES ARMY.

AT their Carriage and Wagon Works, Newton Heath, the Lancashire and Yorkshire Railway have just completed an Ambulance Train for the United States Army, and we are indebted to Sir John Aspinall for the description and photograph which we are able to produce. It is the sixth ambulance train constructed by the Lancashire and Yorkshire Railway, two of which have been constantly used in Great Britain since 1914, and four have subsequently been built for use on the Continent.



AMBULANCE TRAIN BUILT FOR U.S. TROOPS BY THE LANCASHIRE AND YORKSHIRE RAILWAY: Ward Car with Cots arranged for Lying-down Cases.

The train illustrated consists of 16 bogie carriages with a total length of 316 yards, and weighs 442 tons; in general design it is similar to the trains previously built for the British War Office to convey our sick and wounded soldiers to the base hospitals on the Continent, which the public first had the privilege of visiting on this Company's system.

There are altogether 418 cots and berths in the train for patients and personnel, and when the bottom cots are used for sitting-up cases, accommodation is provided for a total of 650.

The train has a water supply of 3,100 gallons; electric light and fans are fitted throughout, a bathroom is provided and ample accommodation for stores.

The letters "U.S." are a distinctive

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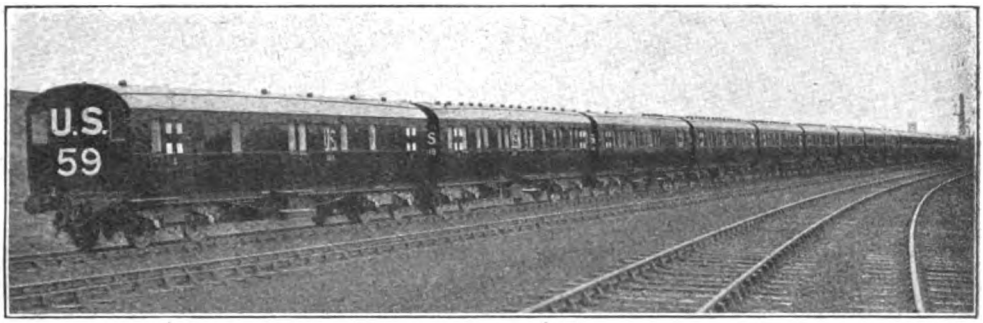

AMBULANCE TRAIN FOR U.S. TROOPS BUILT BY THE LANCASHIRE AND YORKSHIRE RAILWAY.

feature on the khaki exterior, together with the car and medical numbers.

Every detail shows the greatest care and thought given to comfort of the sick and wounded and the convenience of the medical officers, nurses, non-commissioned officers and orderlies in carrying out their duties; throughout the wards, pharmacy, kitchens, staff, personnel and stores cars everything is beautifully finished and advantage has been taken to use all the space in a most effective manner.

A RAILWAY HABITATION.

Photo] [*W. G. Hayward, Cricklade.*

DWELLING HOUSE CONSTRUCTED FROM AN OLD RAILWAY CARRIAGE.
South Cerney, Gloucestershire.

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How the "Underground" Meets London's Traffic Difficulties.

TO every student of railway traffic operation the methods employed are full of interest, while results realised are cause for congratulation. Indeed, from observation and experience during many years we may hazard the opinion that not even in the great centres of traffic across the Atlantic is there anything to be learnt by the traffic officers of the London Underground lines, who have dealt with their own peculiar problems in ways which offer no comparisons with conditions in New York and Chicago.

But while wonderful results have been realised, there are still many difficulties to be overcome, not the least being those occasioned by the special problems of war-time conditions; and in a recent paper Mr. W. E. Blake, the well-known "Superintendent of the Line" for the "Underground" group of railways—an official who, in current *parlance*, is "District born and bred"—sets forth some of these problems and the measures taken, or to be taken, to solve them.

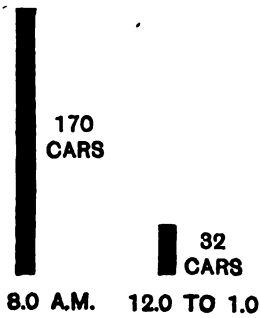

DIAGRAM SHOWING ACCOMMODATION REQUIRED FOR ONE HOUR DURING RUSH HOURS AND NON-RUSH PERIODS, EAST OF WHITECHAPEL, DISTRICT RAILWAY.

In introduction Mr. Blake explains how war-time conditions have affected traffic on the lines concerned, in view of Press criticisms based on the admitted congestion of the "Underground" during the rush hours, this congestion being largely due to the unprecedented concentration of business in London, which necessitates increased travel at a time when the surface means of transport are considerably below the normal.

He points out that the interval between trains during the rush hour periods is necessarily a very short one, and it would be economical to lengthen the trains as much as is practicable, but, unfortunately, when the District and City and South London Railways were constructed, the promoters had not sufficient imagination, and no provision was made for dealing with much increased traffic in this way. It is, however, practicable to run seven car trains on the District line, and it has been found possible to use eight, although to do so it is necessary at the stations to run the front half of the first car into, and leave the rear half of the last car in the tunnel. To avoid a mishap owing to a passenger alighting from such cars in the tunnel, the "ramps" are made horizontal—if such a "bull" can be permitted—for a distance in the tunnel, and that accounts for the narrow ledge that can be seen at the tunnel stations.

Further, more by accident than design, it was found possible to lengthen the platforms at some of the busiest points: for example, at stations west of Hammersmith (inclusive), Earl's Court, Charing Cross and Mansion House, while east of Whitechapel and south of Putney Bridge the stations would accommodate ten cars in the same way as the tunnel stations accommodate eight. An order was actually given for the lengthening of Charing Cross east-bound and Chiswick Park platforms just prior to the war, but, owing to the outbreak of war, the work has not so far been proceeded with. This was in connection with an experimental nine-car train which had been introduced, the idea being to load passengers for Charing Cross and Mansion House stations only in the rear coach of all at Ealing and stations to Hammersmith, as these passengers would not require any platform accommodation until arrival at Charing Cross and Mansion House. This scheme was put into operation in June, 1914, and was continued until the outbreak of war, when it was withdrawn owing to the difficulty in finding the extra men that were needed to look specially after the ninth car

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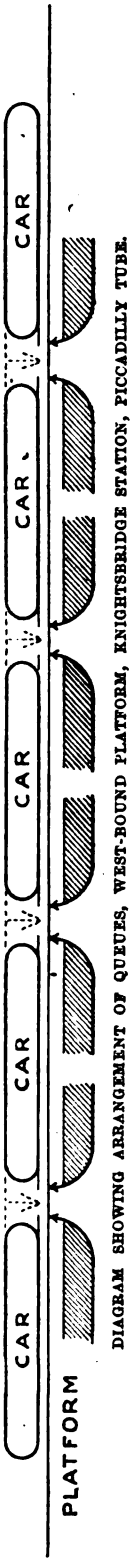

DIAGRAM SHOWING ARRANGEMENT OF QUEUES, WEST-BOUND PLATFORM, KNIGHTSBRIDGE STATION, PICCADILLY TUBE.

and see that passengers did not attempt to alight from it at shorter stations. The idea caught on very well with the public, and no doubt in due course more will be heard of this innovation with the resumption of normal times, and something in the way of a season ticket holders' club car will result, to the mutual benefit of the passengers and the concern.

Another special step taken in the way of lengthening the trains was to make a combination of the facility which existed on the line east of Whitechapel (to Barking) to accommodate infrequent long trains, and the capacity of the railway west of Whitechapel to accommodate shorter but more frequent trains. In this way, two of the trains leaving East Ham about 8 a.m. (the heaviest trains of the day from that end) were made up to ten cars—at one time eleven—and these trains were divided at Whitechapel, each into two trains of six and four cars. This arrangement is still in operation. On the City and South London line the platform accommodation is very tight and precludes the running of a longer train than five modern cars.

On the other lines, there is usually a margin beyond the longest train now run. The Piccadilly, Hampstead and Central London platforms will accommodate seven cars, as against the five or six car trains run, and the Bakerloo will accommodate six cars, whereas most of the trains now run are five cars.

The District Railway have already, in the busiest hour in the morning, reached a maximum of 43 trains per hour. This means that an average interval of rather less than 84 seconds must not be exceeded between the departure of successive trains from a station.

It is found that the actual time that elapses between the first application of the brakes and the bringing of the train to rest is, on the District Railway, about 12 seconds; while the number of seconds occupied in starting a train and bringing it to its maximum speed on the same railway in the tunnel section is, roughly, 30 to 36 seconds. It will be surprising when one looks into it to find that of this time about 20 seconds is occupied in clearing the block joint just immediately beyond the starting signal.

On the Tube railways, the rate of retardation has been very much improved by the adoption of the "Frood" brake block—a very simple and effective measure. With these blocks, the Hampstead trains stop in about 9 seconds from the time of the first application, as compared with 12 seconds on the District trains. These figures are not truly comparative as weight and speed of trains have to be taken into consideration, but they are indicative. Unfortunately, this block is not so reliable for open air work, and, therefore, in its present state, it is impossible to adapt it to District or other trains which run in the open.

To indicate how essential it is that trains shall be got away from the stations as quickly as possible, one has only to remember that if a train stops 30 seconds at a station, in order to carry out the District schedule there can only be an interval between successive trains of less than 54 seconds from the time one train actually starts until the next stops.

When the District Railway was first automatically signalled, the home signal was placed at a minimum distance of nearly 400 ft. from the station. A second home signal was very shortly provided at all the stations in the congested area, so that, immediately the train that was at the station started and proceeded for a certain distance out of the station, the second train commenced to come forward, still maintaining the safe limit. In the same way, a third home signal was afterwards provided at the busiest stations, where, owing to the density of the traffic, the stops were longer than at the others.

So far as our experience in this country guides us, the District type of car is best adapted for the purpose of entraining or detraining passengers quickly, as it has three doors (one at each end and one in the centre On the other hand, the type of car used on the

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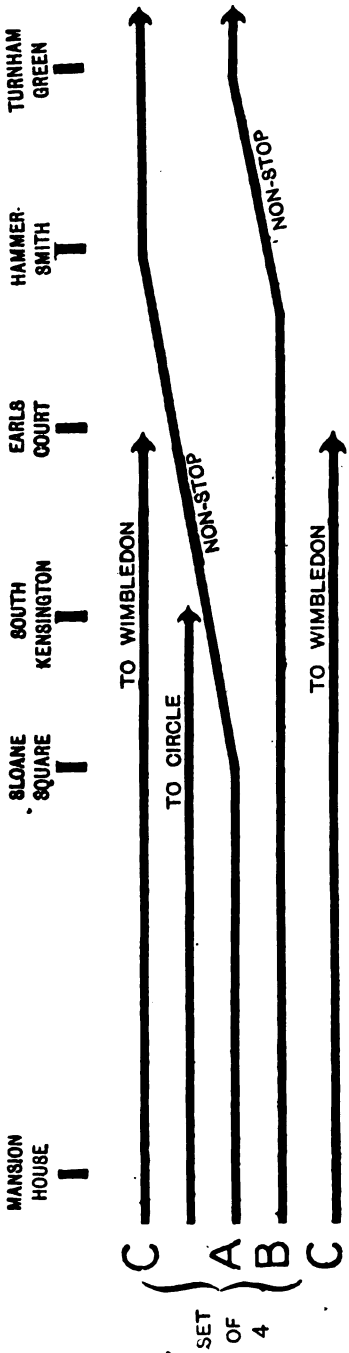

DIAGRAM SHOWING ARRANGEMENT OF "NON-STOPS," DISTRICT RAILWAY, ON AN ORDINARY DOUBLE-LINE OF RAILWAY UTILISING JUNCTIONS.
UPWARD INCLINATION SHOWS SPACE GAINED BY NON-STOP TRAINS

Tube railways is proved by experience to be not so well designed for its purpose, having only two doors (both at the extreme ends) through which passengers have to alight and entrain. The effect of this is that on the platform round the car gangways there is an accumulation of persons desirous of entraining, which impedes the prompt alighting of those wishing to get out. There have been many suggestions made to the effect that one door should be reserved for entrance and the other for exit, although the persons making the suggestion usually overlook the fact that it is quite unworkable, because there is only one door in the end cars (representing at the busy time two-fifths of the total stock), and, if possible to be put into operation, passengers themselves would probably be the first to complain, because at some stations a heavy traffic gets in and none gets out, and at others the reverse is experienced.

It must be apparent to everyone that a middle door to the Tube cars would be a great advantage, and it is regrettable that they were not provided before we were faced with such a problem as exists in London to-day with traffic of a density which has never been experienced before and could not reasonably be anticipated.

The provision of middle doors itself presents a problem, owing to the curved platforms which exist at some of the stations on the Bakerloo Line. Unless these doors can be used at every station we do not get the full advantage of them, as passengers do not understand an arrangement which permits of a door to be opened at one station and not at the next. There is the same difficulty on the Hampstead Line at Charing Cross.

In New York, barriers have been erected on the platforms to compel entraining passengers to carry out the rule that passengers wishing to alight must be allowed to do so first. A modified form of these barriers, suitable to the narrow Tube platforms, has been put into operation at Oxford Circus and Charing Cross (Bakerloo), while others are either ordered, or are in contemplation, for other stations where there is a heavy alighting and entering traffic at the same time. An objection to barriers or queues or any such arrangement is that they require the driver to stop almost exactly at a fixed point on the platform.

In order to ascertain whether a queue system would be practicable or desirable on the Tube platforms, experiments are in progress on the Piccadilly line at

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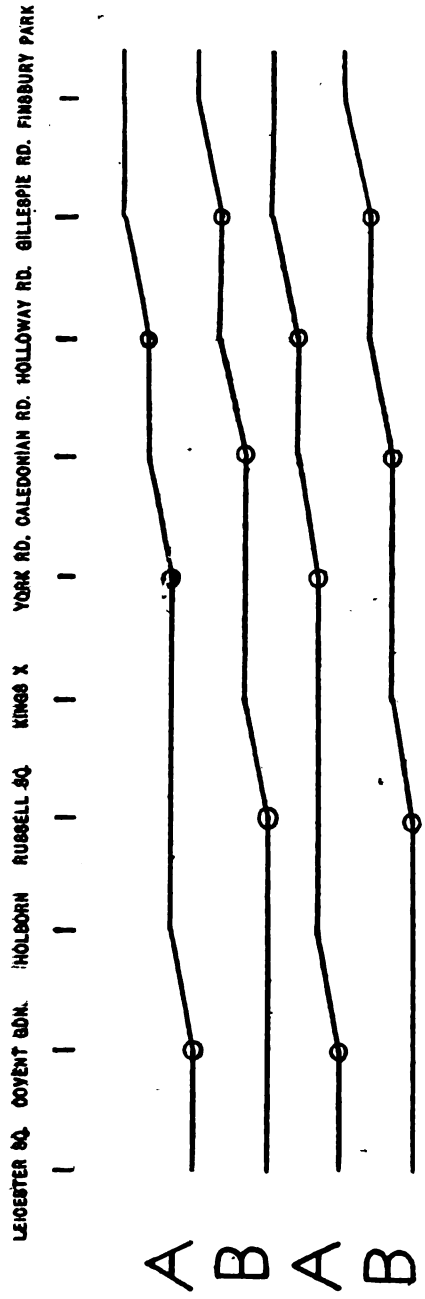
Knightsbridge west-bound platform during the return evening traffic. The entraining traffic there is not particularly heavy, but



THE UPWARD INCLINATION SHOWS INTERVAL GAINED BY NON-STOP TRAINS.

O INDICATES STATIONS SKIPPED

PLAN FOR WORKING NON-STOP TRAINS, PICCADILLY LINE, BY ALTERNATE TRAINS "SKIPPING" STATIONS ON AN ORDINARY DOUBLE-LINE RAILWAY WITHOUT JUNCTIONS.

it is difficult to handle, because few persons alight there and the trains are already full on arrival.

If the driver stops at the appointed place this leaves the gangways clear for any persons who wish to alight, and then the passengers can enter in the order in which they arrived in the queue. It answers pretty well at Knightsbridge, but proves that it would not be adaptable to a very busy station, because the allotted space on the platform is already filled by the comparatively light traffic of this station. It would certainly not suit any other than a one destination line. It takes one more man than the normal platform staff to maintain the queues at this place, and at some other stations it would take more. The system might be further adopted at similar stations on similar lines.

A matter affecting the quick despatch of trains from the stations, and one that has not been given sufficient attention in the construction of the railways, is the position of the entrances and exits on the platforms themselves. There are instances where all the exits from the busy stations are at the same end, resulting in passengers crowding in at that end of the trains and leaving the other end comparatively light. On the other hand, it would not do to have all the entrances and exits in the centre of the platforms.

Time spent at the stations is longer now than before the war, and this is due to some extent to the increased traffic, but to a greater extent to the unfamiliarity of the passengers with the conditions. Before the war, traffic at the busy times was principally made up of regular travellers who wanted to reach their destination as quickly as possible, and knew how to do it; but to-day at the busy times the traffic is largely composed of inexperienced travellers who are certainly

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not so quick in entering and alighting and who stand in the doorways, necessitating passengers who wish to enter or alight pushing by them, instead of getting out of the way.

It is worthy of note how short is the station stop of a heavy train with a capacity for about 800 seating and standing compared with the corresponding time for unloading and loading a 'bus, with a capacity of 39. An instance, taken under favourable conditions, of a 'bus queue at Hammersmith showed the average time to be 1½ min. If trains took so long as this at stations, the maximum service would be reduced to about 26 trains an hour, whereas 43 are actually scheduled.

In regard to traffic pressure, there are two principal "peaks" to be handled, *i.e.*, between 7 and 10 in the morning and between 5 and 8 in the evening, or 1 and 4 p.m. on Saturdays; while there is a third peak, and one which is very difficult and uneconomical to handle, and that is the hour following the close of the theatres at night. The evening peak is heavier than the morning, because workmen's ordinary business, shopping, matinee, and pleasure traffic all return at the same time. The effect of this is shown by the first diagram reproduced.

Non-stopping trains, as a general principle, were established on the District Railway in the latter end of 1907. Three advantages resulted therefrom:—

1. The journey time is shortened and the journey itself made more comfortable and less monotonous.

2. The loading of the trains is better equalised, as, if a train is found to be overcrowded, it can be relieved by some of the stops being eliminated and the traffic for those stations dealt with by other trains.

3. The operating costs are reduced. A non-stop train takes less current to work than a train stopping at all stations, as it is the continual starting that uses the bulk of the current; and, as the journey can be covered in a shorter time, the number of trains required to work the service is reduced accordingly.

In order satisfactorily to work trains at varying speeds separate lines are required for the fast as distinct from the slow trains, but on the District Railway this occurs in no instance. Advantage has, however, been taken of the lay-out of the road, and as the service is built up by trains arriving from various lines it is possible to use the junctions in effect as four roads. The diagram shown on page 268 illustrates this point.

On the Piccadilly line, a system which may be better known by the American appellation of the "Skip stop," is in operation, succeeding trains passing alternate stations. This means that the quiet stations get only one-half of the service; but the scheme works well and is very much appreciated by the majority of the passengers. On the Bakerloo line, the trains are not all of equal value, those proceeding through to Watford naturally being more used than the others, and, consequently, these are made the non-stops. This has a balancing effect, as, being more crowded than the local trains, they take longer time at the stations. A similar arrangement will no doubt be desirable on the Central London Railway when the extension to Ealing is open; as also in connection with trains going north of Golders Green when the Hampstead line is extended.

A series of four posters has recently been issued, having as their text the fact that train delays mean reduced accommodation. They each have a different subject:—

1. The undesirability of crowding the carriage so that the train gates cannot be shut, causing delay in starting.

2. Crowding round the gangway, impeding passengers who wish to alight from doing so, thereby impeding their own entry.

3. The need for passengers passing down the cars and not obstructing the entrances.

4. The need for hurry.

Unfortunately, this does not have much effect on the passengers. The writer recently observed at Charing Cross south-bound on the Bakerloo, when traffic was very heavy, needing the whole of the train service scheduled, that, owing to causes mentioned only 21 instead of 28 trains were got through in the hour. Therefore, at a time when more accommodation was necessary, actually accommodation for 1,680 passengers sitting and a further number standing, or equivalent to one-quarter of the scheduled capacity, was lost in that hour. However, the posters are of service, in that they rightly put on to the public some responsibility for the present abnormal condition of things.

Mr. Blake's article is completed by several tables, and the following extract therefrom is of value.

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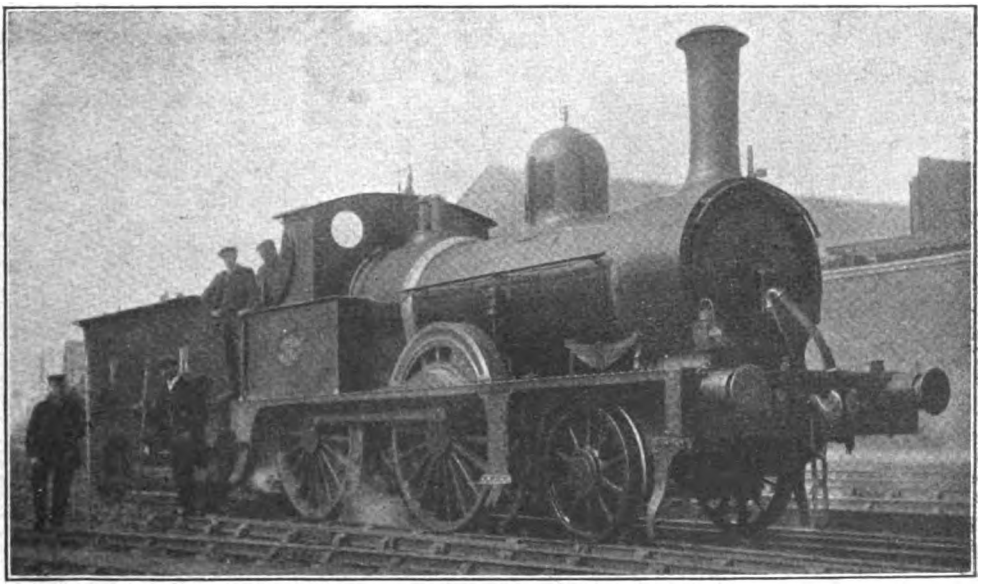
NORMAL AND RUSH PERIOD TRAIN SERVICES.
SCHEDULED TRAIN SERVICE GIVEN ON THE DIFFERENT LINES AT RUSH PERIODS—*December*, 1917.

Line.	Rush Period.					
	Through Service.		Local Service.		Total.	
	No. of Trains per Hour.	No. of Cars.	No. of Trains per Hour.	No. of Cars.	Trains per Hour.	Cars per Hour.
DISTRICT—						
Circle	10	44*	—	—	10	44*
Wimbledon	10	76	—	—	22	136
Putney Line	2	10	10	50		
Richmond	6	40	—	—	6	40
Ealing	10	72	—	—	10	72
Hounslow	4	24	6	21	10	45
Harrow	1	6	5	6	8	16
Uxbridge	—	—	2	4		
BAKERLOO—						
Watford	4	24	—	—	—	—
Queen's Park	24	120	—	—	—	—
PICCADILLY	24	121	—	—	—	—
Aldwych	—	—	15	15	—	—
HAMPSTEAD—						
Highgate	19	95	—	—	—	—
Golders Green	19	95	—	—	—	—
CENTRAL LONDON	24	131	—	—	—	—
CITY AND SOUTH LONDON	25	125	—	—	—	—

* District Circle Trains made up to 5 cars temporarily.

FURNESS RAILWAY.



Photo] [*W. H. C. Kelland.*

NEWER TYPE 2–4–0 LOCOMOTIVE, NO. 46.
With four-wheeled tender.

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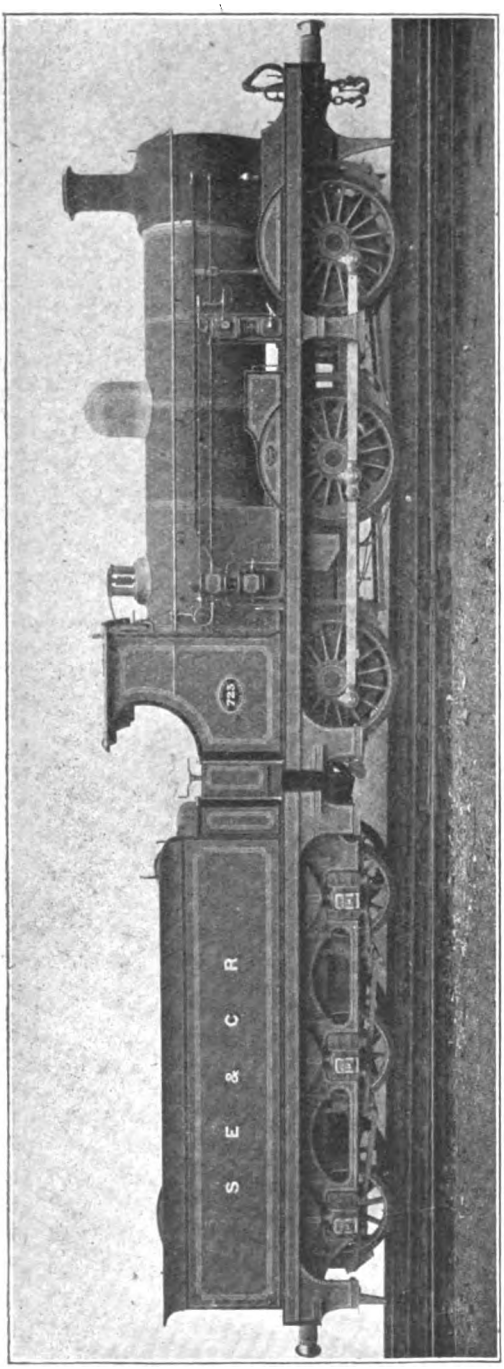
Converted Locomotive, South Eastern and Chatham Railway.



IN the year 1900 Mr. Harry S. Wainwright, then Chief Mechanical Engineer of the South Eastern and Chatham Railway, placed an order with Sharp, Stewart and Co., Ltd., of the Atlas Works, Glasgow—now forming part of the North British Locomotive Co., Ltd.—for some 0-6-0 type goods engines with tenders, and some further locomotives of the same series were put in hand at the Railway Works at Ashford. These engines had leading particulars as follows :—

Cylinders—Diameter	18½ in.
,, Piston stroke ..	26 ,,
Wheels—Diameter	5 ft. 2 in.
,, Wheelbase	16 ,, 6 ,,
Heating Surface—Tubes ..	1,089·32 sq. ft.
,, ,, Firebox ..	110·68 ,,
,, ,, Total ..	1,200 sq. ft.
Grate area	17 sq. ft.
Boiler pressure	160 lbs.
Weights, in working order—	
On leading wheels ..	15 tons 3 cwts.
,, driving ,, ..	16 tons
,, trailing ,, ..	12 tons 13 cwts.
Total	43 tons 16 cwts.
Tender—Water capacity ..	3,300 galls.
,, Coal ,, ..	4½ tons

The engines proved a useful class, and they were finished in the attractive style then resorted to by the South Eastern and Chatham Railway, being smartly lined out and provided with brass dome covers, with a brass band next to the firebox, and a covering of the same material at the base of the safety valves.

One of the engines of this series has recently emerged from the Ashford Works in the form of a saddle tank engine, bearing the number 685. In carrying out the work of conversion the least possible interference with the original construction has been made. The boiler, cylinders, wheels and valve motion remain as before, and the wheelbase is also unaltered, but by transferring the water and coal supplies to the engine instead of their being carried in a separate tender the individual axle weights and consequent total weight available for adhesion has been greatly increased, although, as a matter of

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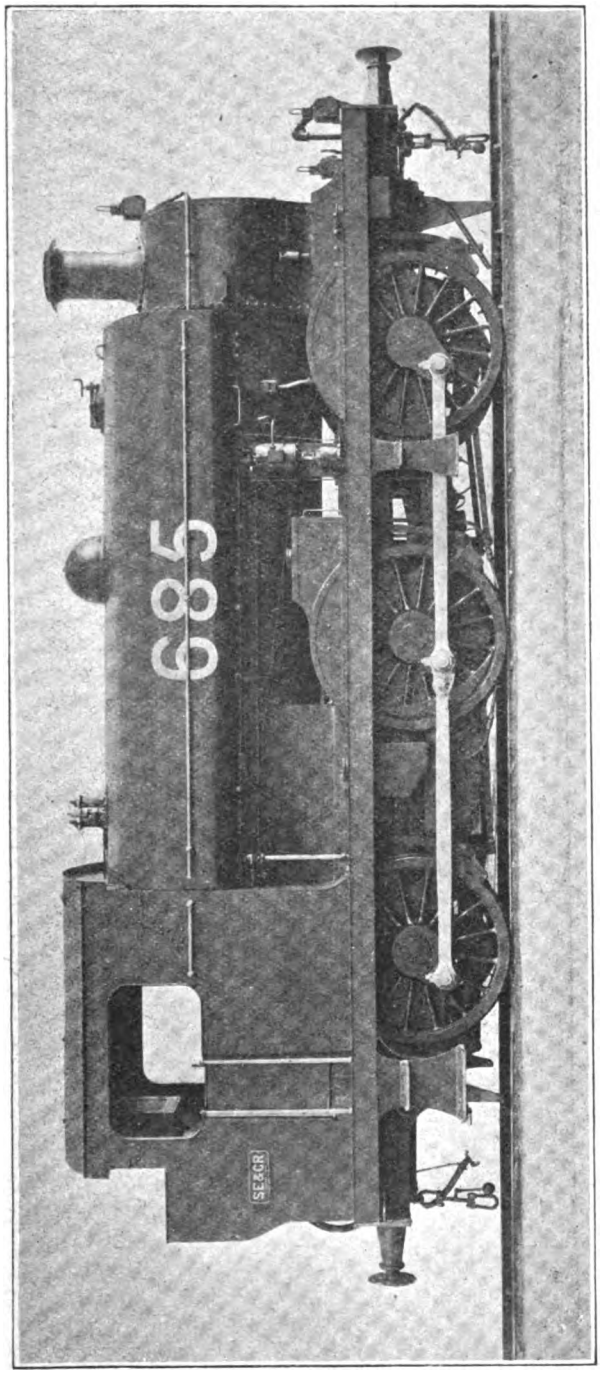
course, the water and coal supplies are both reduced. By this means a thoroughly up-to-date shunting engine of a powerful type has been evolved from a type of locomotive which had become to some extent unsuited for present day needs, and although the proportions have been practically unaltered, and were always moderate, in the new sphere of action for which the engine is intended, they will be ample for the needs of the work to be performed.



LOCOMOTIVE CONVERTED TO A SHUNTING ENGINE.

A comparison of the particulars given shows that, in its present form, the engine weighs 53½ tons, as compared with the 43 tons 16 cwts. of the original design without its tender; a gain, roughly speaking, of 10 tons for adhesion. The cylinders remaining as before, there is no alteration in the tractive force exerted by the locomotive, which at 80 per cent. of the boiler pressure amounts to 18,371 lbs., and it simply means that in the case of the saddle tank engine when moving the heaviest loads the tractive force can, if desired, be utilised more fully. The engines originally appeared in the Company's books as Class "C," but the saddle tank engine No. 685 is now classified under the letter "S." A commodious type of cab has been fitted, the steam standing and steam reversing gear are retained and the engine is equipped with continuous brake appliances. The converted engine has all the features which are essential in a goods shunting type. The greater adhesion now available enables it to readily and smartly handle the heaviest loads, whilst the retention of the steam reversing gear adds greatly to the efficiency of the locomotive in shunting work; its utility being further enhanced by the provision of a powerful steam and hand brake. This is a good example of locomotive conversion, and shows what can be done in the way of producing a

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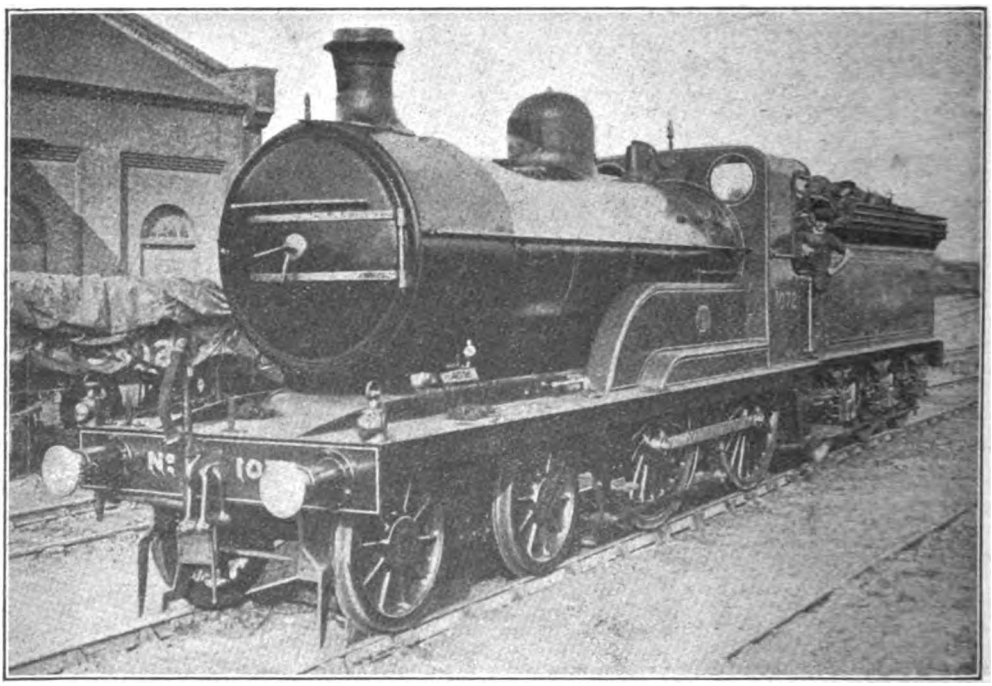
thoroughly modern class of engine from one which has become in some degree behind the times, without, however, altering any of the main proportions or characteristics of the original design. We are indebted to Mr. R. E. L. Maunsell, M.A., Chief Mechanical Engineer of the South Eastern and Chatham Railway, for the particulars relating to the two classes of engines, and for the photographs from which the illustrations have been reproduced. In the case of the shunting engine, the weight distribution is as follows :—

On leading wheels	17 tons 10 cwts.
,, driving ,, ...	17 ,, 10 ,,
,, trailing ,, ...	18 ,, 10 ,,
Total	53 tons 10 cwts.
Water capacity	1,200 galls.
Coal capacity	2 tons

The above figures constitute the only departure in the matter of proportions from those possessed by the original engine.

A GREAT NORTHERN RAILWAY REBUILT LOCOMOTIVE.



Photo] [*W. H. C. Kelland.*

4–4–0 LOCOMOTIVE, NO. 1072.
At Cambridge.

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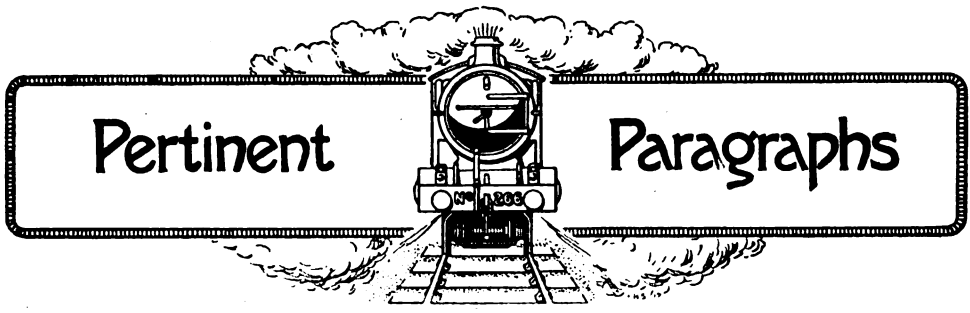

Paper Shortage.

On another page the Railway Magazine announces with great reluctance that commencing May, 1918, its price will be one shilling net.

In coming to this decision we feel assured of the continued support of the large circle of readers, whose interests we have studied through all these difficult years of war.

We have laboured under very adverse conditions, and have had to contend with alarming increases in the costs of paper, illustration-blocks and printing, and in common with other business people, the general rise in prices consequent upon the abnormality of the times in which we find ourselves.

Now, in addition to the enormously increased cost of production, we are confronted with a further drastic restriction in the quantity of paper with which we are rationed. Our circulation, always a large one, has for the past twelve months shown a decided upward tendency. So great is the additional demand for the Railway Magazine, some of the London wholesale booksellers have doubled their orders for this April issue. Such advances in circulation we are quite unable to meet, at a time when our paper supplies are being further curtailed.

There is one thing we can advise in order that readers who reside in big urban neighbourhoods may not go without their monthly study or perusal of the Railway Magazine, and that is the establishment of magazine clubs in railway works and offices, and in other business establishments. These already exist in many places and one copy of a magazine will pass through a dozen or twenty hands. This plan, in face of the prevailing paper famine, is worthy of further adoption. In more remote parts—and the Railway Magazine is found in the most out-of-the-way corners of the Kingdom—regular readers may lend their magazines to friends, or two or three readers may share the cost of one copy.

We have done our best to meet every difficulty and if the latest rise in price causes disappointment to any section of our readers, we have at least the consolation of knowing that the Railway Magazine has not raised its face value until absolutely forced.

In regard to the future it will ever be our endeavour to give the best possible value in paper, letterpress and illustrations. The charge to annual subscribers, who pay in advance, will be 13s. 6d., but we will willingly take the subscription in two half-yearly payments of 6s. 9d. each. A reader who is not a direct subscriber, but purchases through a bookseller or a newsagent, should make certain of his Railway Magazine by giving a definite order, since the limited output, in the face of the greatly increased demand, will make it impossible to depend on procuring this periodical casually in the happy fashion of pre-war days.

Computation of Train Loads.

From Eltham, Mr. W. Fyffe, on this subject communicates :—

With reference to Mr. Ronald Muirhead's query in January Railway Magazine *re* equivalent train loads on gradients, the following table selected from the "American Civil Engineers' Pocketbook" may be interesting. The computing of equivalent loads is a fine art in the States, where in the west the gradients are set out to fully develop the power of the locos as train engine one pusher and two pusher grades, with the maximum load, which is usually 2,500 tons :—

Speed : 10 miles per hour.

Grade	Train resistance, 6 lbs. per ton. Load in Tons.	Resistance per Ton.	Train resistance, 8 lbs. per ton. Load in Tons.	Resistance per Ton.
level	3,868	6 lbs.	2,874	8 lbs.
1 in 500	2,278	10 lbs.	1,880	12 ,,
1 in 200	1,384	16 lbs.	1,218	18 ,,
1 in 100	810	26 lbs.	745	28 ,,
1 in 50	411	46 lbs.	390	48 ,,

The above table is computed for a consolidation locomotive weighing 107 tons, with tender and load 53 tons on the drivers. Factor of adhesion $\frac{8}{40}$. Continuous tractive effort, 23,850 lbs. Resistance of train with first-class track and rolling stock is usually 6 lbs. per ton. Starting friction may be as high as 14 lbs. per ton.

Scottish Traffic Problems.

At the annual general meeting of the proprietors of the Glasgow and South Western Railway, Sir James Bell, Bart. (the chairman of the company) dealt very fully with the railway problems of the present times. He remarked :—

"The past year has been a very trying one for all connected with railway management and direction, as the difficulties have been many, and to the travellers on our lines we know inconvenience has been caused by the compulsory

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reduction of the train services, but these reductions were not carried into effect without much thought and consideration being given to them by all the officers concerned, and where, in practice, they found improvements could be made these were at once carried out. It has been a constant anxiety keeping our engine power up to our requirements, as we had to send a number of locomotives to English companies to replace those they had sent abroad, and we had also to send a certain number of trucks and vans overseas.

"A re-organisation of coal transport, which was brought into force on July last, was designed to reduce the haul, save cross working, and so relieve the pressure at junctions, both in marshalling and shunting. To put it briefly, it means that coal should be consumed as far as possible in the area in which it is produced, or in the nearest market. The new arrangement is working very satisfactorily in regard to saving of mileage, and the Coal Controller estimates throughout Britain a saving of 700 million ton miles annually. We estimate our saving at 2,500,000 ton miles.

"Last year I referred to the pooling of the Caledonian, North British, and Glasgow and South Western wagons, which came into operation in June, 1916. This arrangement is continuing to give satisfaction alike to railway companies and traders, as a freer and better use of wagons has been made, and the detention and demurrage has been less than in the previous years. The pooling of traders' wagons also was considered last year, but nothing practical was done; it is again under consideration. The general question of transport, and how to make the best and most use of the plant we have, is ever before all the companies, and with the view of arriving at a more economical method of transport and the saving of engine power, the Scottish and English companies recently adopted a scheme whereby in the conveyance of merchandise between Scotland and England, and England and Scotland, certain traffics were allocated to certain companies, and, in this way, better loading of wagons is assured, more facility in handling, and less shunting and marshalling has resulted.

"To carry these desirable results further, the Scotch companies who own Clyde steamers are endeavouring to find some method by which the undue competition of former years will be ended. How this can be done, whether by all the steamers being put into an owning company, which will arrange the service, is not far enough advanced in consideration to allow any opinion to be formed, but some solution which will avoid undue competition we all hope may be found. Out of our fleet of nine steamers, all except the *Glen Sannox* were requisitioned by the Admiralty."

Glasgow and South Western Railway Requirements and Extensions.

DEALING with the subject at the meeting referred to in the previous paragraph, Sir James Bell, Bart., said:—

"At the Wharncliffe meeting you approved unanimously of the Bill we are promoting for various requirements and extensions, and as full information regarding the contents of the Bill was then given I need not repeat it, but I should like to very briefly state why we consider it desirable to proceed with it at this time.

"You are aware that from Glasgow to Dalry we now have four lines of rails, and from Dalry to Kilwinning the widening is complete, but as we are unable to get rails we cannot bring additional lines into traffic. When we get the rails laid to Kilwinning, we shall be able to help the Largs, Ardrossan, Saltcoats, Stevenston Branch, on which from Nobels and other sources the traffic is very heavy, but, without further ground, we cannot at all give the service we desire.

"We are greatly pressed in this district for siding and marshalling accommodation, and we have scheduled ground for this purpose, it is necessary to get it if we are to give the facilities the district requires in the present, with due allowance for its growth in the future.

"For years past the question of widening the line between Kilwinning, Irvine and Ayr, has been under consideration, and those of you who are familiar with this part of the line will appreciate the fact that, except for a short distance at Prestwick, until you get to Ayr, almost no houses abut on the line. Having very few buildings to acquire, and no severances to pay for, the railway, through the freedom from almost any cuttings, will comparatively be very inexpensive to make, and on the route there is much ground to develop.

"We approached the representatives of the proprietors of the greater portion of the ground required alongside of the railway, and we have acquired the right to it on such terms that we had no hesitation in coming to an agreement, the proprietors and their representatives, believing as we do that there is no more effective way to develop a district than an ample railway service.

"For these, and other reasons, we are promoting this Bill now, so that if we get the Statutory Powers asked for, we will prepare our plans and be in a position to proceed at any favourable time after the war.

"We desire to explain this as we are making no change in our policy, and we must act as if present conditions were only temporary. If we do not look well ahead and anticipate the needs of the area served by the Glasgow and South Western Railway Company, the making of lines when ground is occupied is so costly as to be prohibitory, or make it impossible to pay a fair return on the outlay. In the Saltcoats district we have been sadly hampered for lack of ground, and nothing will make for greater prosperity to the town and neighbourhood than ample and increasing railway facilities.

"Mr. MacDonald at the Wharncliffe meeting asked if the State would take over the railways. Of the Government's intention we know nothing, but we are in a strong position if negotiations should take place.

"We have a railway that has steadily paid

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a fair dividend serving an area that is becoming increasingly a manufacturing district, with new works, new industries, opening coalfields, harbours, shipbuilding, and an increasing population, and also serves some of the most attractive residential seaside resorts in the Firth of Clyde.

"If negotiations are ever initiated for the acquisition of railways by the State, it is certain these will extend over a considerable time, as they will be difficult, far reaching, and the sums involved very large. It does not appear to us that any good purpose would be served by our saying more than this at present, but we must ask your confidence if negotiations should arise."

The Financial Future of British Railways.

A BELFAST RAILWAY MAGAZINE reader, Mr. R. G. Lindsay, writes :—

"I thoroughly endorse the opinion of your correspondent 'Hereford' in your February number.

"It is clearly manifest that railways in paying a heavy passenger duty to the State, in having to contend with an almost continuous demand for higher pay and shorter hours by the men, also an ever increasing scale of local rates due to the spendthrift proclivities of Urban and County Councils, cannot possibly in future under such conditions give the facilities for cheap travelling or moderate rates for carrying merchandise, more particularly in the case of overseas traffic, that were largely in vogue before the war.

"To assist railways in future to be successfully one of the principal mainstays of the commercial and social life of the community, in the matter of cheap and expeditious travelling, moderate and reasonable charges in connection with goods, I would free the railways entirely from local rates for the following reasons :

"1st. The companies have practically no voice or control in the expenditure of local rates.

"2nd. They are frequently over assessed.

"3rd. As 'Hereford' points out they are obliged to contribute towards the upkeep of roads that commercial motors in active competition have free and untaxed use of.

"4th. Because in the past, and at any time to come, the companies have been obliged to contribute to the construction and maintenance of municipal trams, that abstract their traffic without any compensatory advantages in return.

"5th. That additional lines, new and more commodious stations for the comfort and convenience of the public, is at once made the excuse for higher assessment. (Mr. Edwin Pratt points this out very cogently in his book on Railway Nationalisation, as an instance of how the railways are had.) In return for total exemption the companies could be responsible for the making and maintenance of all approach roads to their stations, also road bridges over and under their lines.

"The present advantageous arrangement of pooling wagons might also be extended to main line coaching stock, and a standard type of vehicle adopted, of moderate weight and dimensions, yet providing a reasonable amount of comfort and seating accommodation instead of the absurdly heavy de Luxe coaches or trains that have come into fashion, as the result of each big company trying to go one better than its rivals. Personally I would much prefer a moderate degree of comfort, moderate speed, and cheap fares than luxury, breakneck speed and expensive travelling.

"As it is, the unduly heavy train, costly to build and maintain, means very often double heading or running in duplicate, both a source of expense, and the latter congestion of traffic. I fully agree with 'Hereford' that Board of Trade control and supervision should be considerably modified and the companies allowed to manage their own affairs without interference from outsiders who know little and probably care less.

"Further the companies should be able to carry out improvements and alterations without going to Parliament to ask permission, thus saving those heavy expenses that seem inseparable in obtaining Parliamentary sanction for work that the public reap the benefit of afterwards. I have never sympathised with the view taken by so many people that railways are a monopoly in the full sense of the term. If the companies possess certain legalised advantages they have paid heavily and are fully entitled to such; further the fact that they have been able to offer a very superior means of communication has not resulted in closing the roads or canals, or driving coasting steamers off the sea. In future the railways should be afforded every encouragement for developing traffic on sound economic principles, by the removal of those burdens which in my opinion they are unjustly handicapped with; in such case the history of British railways in time to come will I hope be a record of fair dealing, as compared with the discreditable transactions and acts of repression in the past which the student of to-day can read and marvel at."

Which is the Most Powerful 4-4-0?

WE are sometimes asked the question, "Which is the most powerful 4-4-0 type of locomotive on British railways?" and the question is not altogether easy to answer. Theoretically, at least, the "George V." class engine of the London and North Western Railway can put forward a strong claim for the distinction. An examination of the proportions of the various 4-4-0 type locomotives reveals the fact that the engines named above are superior in the matter of firebox heating surface, and therefore, in that of firebox volume. There are other locomotives of the same class which excel in the matter of grate area, but this, although very important, has not the same bearing on the question as firebox volume and surface. The figures below exemplify three cases which may be taken as typical. They are as follows :—

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	Firebox heating surface. sq. ft.	Grate area. sq. ft.
L. & N.W.R. (George V.) ..	165·75	22·4
M.R. (3-cylinder compound)	151	28·4
N.E.R. (R1 class)	158	27

In spite of the fact that the George V. engine has the smallest amount of grate area of the three, it possesses the most efficient firebox, its capacity being greater than the others. The firebox is placed between coupled axles 10 ft. apart, and made very deep. When designers are prepared to extend the rigid wheelbase of their 4-4-0 type engines to 11 ft. or more, they will be able to get fireboxes having capacities as high as 206 cubic ft. or more and 195-200 sq. ft. of heating surface, and a very efficient boiler will result.

C. de Fer du Midi.

In forwarding the French train photograph reproduced on this page, Mr. E. A. Gurney-Smith furnishes the following entertaining details :—

"These fine 'Pacific' engines share the traffic with many other locomotives of varied and most weird types, though I noticed that certain types seemed to keep to their own trains, but the trains hauled by the older engines, at any rate on the Bayonne-Pau-Lourdes-Toulouse line, were just as fast and as heavy as those taken by the 'Pacifics.'

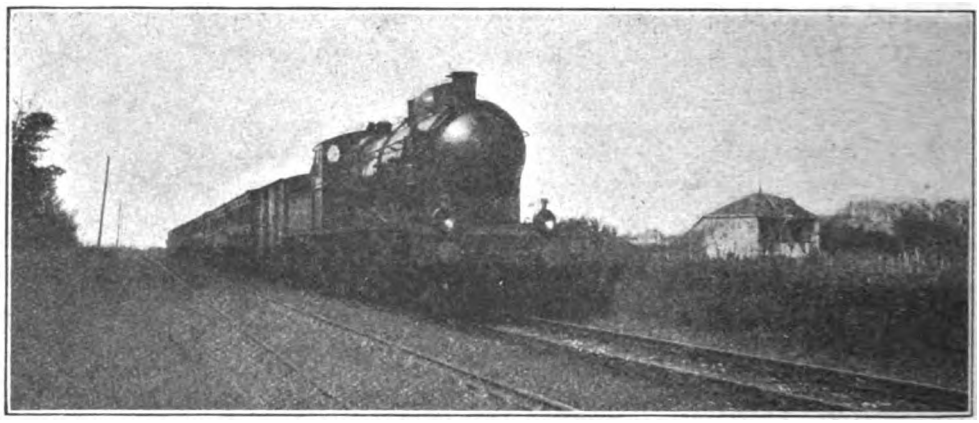
"Besides the section just mentioned these newer engines run, of course, on the more important main line from the junction with the Orleans Railway at Bordeaux through Bayonne to the Spanish frontier, but the only expresses worthy of the name that I am aware of are those of the International Sleeping Car Co. Apart from the Trains de Luxe of this company I only saw one coach running on more than four wheels, though there are probably more. For this reason, and owing to the comparative slowness of the trains travelling on this line is most wearisome, but when I was last in the district, a year or so before the war, there were rumours of many and great improvements, of which the splendid type of locomotive illustrated may well be the forerunner.

"In normal times it would surely pay to modernise things on the Midi Railway, for with places like Pau, Biarritz, Lourdes and Carcarsonne as centres and the magnificent country of the Lower and Higher Pyrenees an enormous tourist traffic could be obtained. Amongst the rumours that I heard at Pau was one that considerable sections of the line were to be electrified, and this might well be so owing to the sources of water-power in the Pyrenees.

"The permanent way is laid with chairs as in England, but, as can be seen in the photograph, it is very overgrown with grass and weeds.

"A very pleasant day trip from Biarritz is to San Sebastian in Spain, but the antiquated Midi train that I started in compared very badly with the beautiful Spanish one of bogie central-corridor coaches that I changed into at the frontier. The station at Biarritz is palatial, a very great contrast to the dismal train-sheds at Bayonne and Pau.

"The day that I went to Lourdes I went on after lunch to a little mountain village in the Higher Pyrenees called Argeles-Gazost, but when I went to the station at this last place in the early evening to return to Pau I found that the train marked in the 'Continental Bradshaw' was not going to commence running until the 29th of the month! So there was nothing left but to somehow obtain an automobile, which we successfully managed, so that we saw what we should otherwise have missed, the splendid Napoleonic roads winding around the edges of precipices, with extraordinarily easy gradients considering the mountainous nature of the country."



Photo] [*E. A. Gurney-Smith.*

C. DE FER DU MIDI.

Express from Bayonne to Pau, near Peyreharade, "Pacific" type locomotive.

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Chatham Line Working.

FROM a lengthy communication, signed F.A.B., concerning Mr. Ahrons' recent articles in the RAILWAY MAGAZINE on the London, Chatham and Dover Railway locomotives and train working in the latter part of the 19th Century, the following valuable information and comment is culled :—

In dealing with the speed of trains, the wonder is that such running as existed, and exists to day, is possible at all. If one considers the line in relation to the curves and gradients, it is not possible to get any considerable stretch of line where a high speed can be maintained for any distance. From the very start at Victoria there is a rise of 1 in 60 to Grosvenor Road, and the same applies on getting away from Herne Hill, where the gradient is 1 in 100 to Sydenham Hill. Very few of the banks can be approached at high speed owing to curves. The curves through Rochester extend right up to Gillingham. The speed at Canterbury is neutralised by the necessary reduction through the station on account of the curves. On the journey from Dover the adverse gradients and curves affect the average in a worse degree.

Mr. Ahrons mentions a special run at high speed in 1896. I happened to have travelled by that train in both directions, and it might be of interest to reproduce the log of the run taken from an article I sent to one of the engineering papers in June, 1896.

Distance. m. ch.	Stations.	Time. h. m. s.	Speed. m.p.h.
—	Victoria	12.50.15	—
3.78	Herne Hill ..	55.15	*42·0
8.74	Beckenham ..	1. 1. 5	55·5
11.74	Bickley	4.45	53·2
17.52	Swanley	10.25	60·1
26.69	Sole Street.. ..	19.30	60·7
32.75	Strood	25.15	*63·4
35.75	New Brompton ..	29. 0	48·0
44.58	Sittingbourne ..	37.40	†60·8
51.79	Faversham ..	45. 5	57·3
55.24	Selling	48.50	53·0
61.66	Canterbury ..	55.25	59·5
71.53	Shepherds Well ..	2. 5.30	58·5
77.76	Dover Harbour ..	11.45	60·4
78.34	Dover Pier ..	2.12.50	32·2

Average, Victoria to Dover Pier 56·9 m.p.h.

* Reduce speed.

† Reduce speed, renewal of bridge.

The article in question gives the details of the run on the Nord Railway of France and the return run. The average speed from Victoria to Paris, including the sea passage and all stops was 44·15 m.p.h.

Railway Staff Catering.

THOROUGHLY catholic in its tastes, every phase in railway life seems to come within the ken of the Operating Efficiency Meeting members, over whom Mr. H. E. Blain, Operating Manager, London Underground Electric Railways, so efficiently presides. At a recent gathering the *piece de resistance* was a paper on "Staff Catering," by Mr. S. C. Rodway, Assistant to the Superintendent of Catering, who described the catering organisation in connection with both the 'Bus Company and the Railway Companies. The former has 24 mess rooms, the first of which was opened on March 10th, 1913, and the latest on the 11th ultimo. There were five mess rooms on the Railways.

The facilities were divided into three main grades :—

(A) Institutes erected at garages and stations, which included a mess room and a billiard room, and reading room—full catering being provided.

(B) Mess rooms at 'bus terminal points, usually being small shops or temporary buildings, where full catering was also provided, and

(C) Light refreshment rooms at some of the 'bus terminal points, where light refreshments only were provided.

The staff organisation consisted of a Superintendent, and an Assistant Superintendent of Catering, and a staff of over 200 stewards, stewardesses, cooks, counter-hands, general hands, and cleaners. The catering staff wore a standard uniform—the male staff wearing white coats and aprons, and the female staff a black dress and white apron, the Companies defraying cost of washing.

The difficulties in connection with the staff personnel under war conditions were referred to, and a review given of the mess room working for the past three years, during which the transactions had greatly increased, the record for 1917 being, approximately, 4½ millions.

The catering organisation was described, and details were given of different food values, the study of which was of great importance in the present conditions of food regulations.

Mr. Rodway made a number of suggestions for development of the catering operations, and made it clear from comparison of food prices, the great benefit derived by the employees from arrangements which supplied them with good reliable food at the cost of its purchase and serving, the Companies bearing all expenditure in connection with buildings, maintenance, equipment, and power for cooking.

A Much-Noted Irish Railway Run.

MANY RAILWAY MAGAZINE readers, resident in Ireland, have kindly forwarded newspapers containing sensational accounts of a "Remarkable Travelling Feat" by one whom some of the journals described as "Mile-a-minute Pirrie."

We are pleased, through the courtesy of the Great Northern Railway (Ireland), to be able to give the facts of the case.

Lord Pirrie asked for a special train on the date in question to enable him to visit Dublin on important war business and return to Belfast with as little delay as possible.

The distance of 112½ miles was covered in 109 minutes on the up journey to Dublin, and in 114 on the return journey to Belfast. In the first case there were five "slacks," two of them as low as 20 miles an hour, and on the return

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journey five slacks, one of which was as low as 10 miles and another 20 miles an hour.

The average speed on the up journey was just over 62 miles an hour, and on the down journey just over 59 miles an hour. There was really nothing remarkable about the performance as the load was insignificant—one bogie coach 50 ft. long, weighing about 25 tons, and it was therefore not necessary to use the largest class of express engine. The one employed was No. 114, a 4-4-0 type, built in 1904, with 6 ft. 7 in. coupled wheels, boiler pressure 175 lbs. per sq. in., total weight in working order 49½ tons.

We may add Lord Pirrie is the chairman of Messrs. Harland and Wolff, the largest shipbuilding firm in the Kingdom, who are probably doing as much war work as any yard in the British Isles at this time. The Company would not run a special train of this character except on what may be described as urgent war work for the Government.

Since the foregoing was written Lord Pirrie has been appointed by the Government, Controller-General of Merchant Shipbuilding.

The Hedjaz Railway.

MAJOR C. J. C. STREET directs attention to an aspect of the British operations in Palestine that is not, perhaps, generally recognised, and that is their bearing upon the struggle which is being waged against the Turks by the Arab forces under the King of the Hedjaz.

Ever since the Arab revolt against Turkish rule, and the establishment of the Sherif of Mecca as King of the Hedjaz, the Arabs have carried on guerrilla warfare against the Turkish forces in Western Arabia. For many years Turkish influence in Arabia has been on the wane owing to the tyranny and corruption of Turkish administration. In 1907, in a paper read before the Central Asian Society, it was said that "it would seem that Arabia is practically lost to the Sultan, for the Arab troops have repeatedly defeated the Imperial forces under Feizi Pasha, with heavy losses."

It was mainly to deal with this defection that the Hedjaz railway, destined to connect Aleppo with Mecca, was commenced in 1900. Ostensibly designed to deal with pilgrim traffic, it was in reality a strategic line of the first importance, an importance that was fully realised by the Germans, whose influence in Turkey was then predominant. Von der Goltz himself wrote:

"The great distances dividing the Southern provinces from the rest of the Empire, besides causing difficulties in holding them in control, made Turkey unable to concentrate her strength in case of great danger in the north. It must not be forgotten that the Osmanlie Empire in all former wars on the Danube and in the Balkans has only been able to utilise half its forces. Not only did the far-off Asiatic provinces not contribute men, but they, on the contrary, necessitated strong reinforcements to prevent the danger of their being tempted into rebellion. This will be quite changed when the railways to the Persian Gulf and the centre portions of the Red Sea are made. The Empire will then be in a way rejuvenated and have renewed strength."

It follows, therefore, that one of the chief strategic aims of a policy directed against Turkey would be the cutting of these railways. As regards the latter, the King of the Hedjaz, by repeated raids, has carried out these aims to perfection. Gradually working northwards, he has cut the railway at several points, his most recent achievement being to destroy a troop train upon it near Tobuk, 350 miles north of Medina.

The original line was started as a national work by the Turkish Government. A railway, constructed by the French, was already in existence between Aleppo and Damascus, and from the latter town the line must proceed on its route of nearly a thousand miles. All Turkish officials were compelled to pay one month's salary towards the cost of construction, and all Mohammedans were asked to contribute, under the pretence that its object was merely to render the pilgrimage easier.

Under these conditions, the line was completed as far as Medina, but it was never a very efficient link of transport. The gauge is only 1·05 metres, it was never very well supplied with rolling-stock, and the supply of fuel and water presented great difficulties in the desert sections. However, it formed a direct menace to Egypt and even to Aden, and the services rendered by the King of the Hedjaz are by no means the least of those that have been rendered to the Entente cause.

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WHAT THE RAILWAYS ARE DOING.

MR. J. M. JACKSON, who has been appointed to the newly-created position of Assistant Locomotive Engineer of the Brighton Railway (rendered necessary owing to the absence on Active Service of the company's Chief Locomotive Engineer, Col. Billington), is a native of Lanarkshire and was born in Glasgow. He received general education in Madras, India, and later a technical training in engineering at the Glasgow and West of Scotland Technical College. He served an apprenticeship in the shops and drawing office of Messrs. Neilson, Reid and Co., locomotive builders, and thereafter obtained some experience in general and marine engineering on the Clyde. After serving with Messrs. Sharp, Stewart and Co., locomotive engineers, for 12 years in the capacity of leading draughtsman, he entered the service of the London, Brighton and South Coast Railway in 1906, and was appointed Chief Draughtsman in 1912. When at the beginning of 1917 Mr. L. Billington, the company's Locomotive Engineer, received a commission in the Royal Engineers and was sent on a mission to Roumania, Mr. Jackson was appointed Deputy Locomotive Engineer during his absence.

* * *

MR. JOHN CLIMPSON, who for many years was guard of the Continental Boat Train between London Bridge and Newhaven, recently died at his residence at Wimbledon, aged 85. During his many years' service Mr. Climpson made many friends, and among his associates was known as "Gentleman John." He entered the service as a young man, 17 years of age, in January, 1850, as a nominee of the late Mr. George Hawkins, at one time Traffic Manager of the Brighton Railway. He remained at London Bridge for nine years, when he was transferred to Brighton station, where he stayed for seven years, and in 1866 returned to London Bridge, where he remained until his retirement from the railway on May 25th, 1894, when he was presented at Newhaven with a purse of £50. Mr. Climpson interested himself in various kinds of philanthropic work, and at Brighton terminus there is still evidence of the good work he did for the widows and orphans of railwaymen. He was the trainer of a Scotch collie called "Help," which, before its death, collected over £1,000, and at its death the dog was stuffed and has been exhibited at certain stations. On his retirement, the late Mr. Climpson had one regret, and that was his inability to take with him the railway watch, which had been in his possession for over 40 years. He was fond of relating an incident in connection with it. A year or two before his retirement something went wrong with his watch, and being afraid that if he sent it in to the company for repairs he might not have the same watch returned to him, he made it his business to call upon the makers, and they, assuming he had come to complain, charged him with having used his watch very roughly. "Gentleman John," with that merry twinkle in his eye, listened patiently to the unwarranted censorial remarks, and then quietly stated how long he had carried his watch, to the great confusion of the attendant. In the early days of the Continental service *vid* Newhaven, Mr. Climpson was accustomed to take his passengers through to Paris. He was well-known among the London banks, as during his many years' service he had been the custodian of bullion to the value of many millions of pounds which passed to and from the Continent. Born and brought up at Willingdon in Sussex, he possessed a certificate for agriculture, issued by the late Mr. Freeman Thomas (father of the present Lord Willingdon) for those young men who had made themselves efficient in agricultural work. He was associated with the Brighton Railway in some way before 1850, and was present and took part in the opening of Eastbourne station. About this time he met with an accident

MR. J. M. JACKSON,
Appointed Assistant Locomotive Engineer, London, Brighton and South Coast Railway.

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which affected his health for the remainder of his life.

* * *

EARLY in 1916 a Voluntary War Service Corps was formed in connection with the Metropolitan Railway, and at the meeting last month of the various sections, at which 500 were present, Mr. R. H. Selbie, the General Manager presiding, wonderful work was reported of the progress made. Mr. Selbie said how gratifying it was to know that the staff of the Metropolitan Railway, who were either too old for the Forces or could not be spared, had volunteered in such large numbers for the various sections of the work. The Munitions Section Secretary reported that upwards of half a million shells had been dealt with and that an official communication from the Minister of Munitions had been received commending the work of the Munitions Section and marked his appreciation of its efforts. The Red Cross detachment has worked at numbers of hospitals and has helped the police in air raids. The Entertainment Section has given upwards of 51 concerts to wounded soldiers in the hospitals. The Hospital Market Garden Section has cultivated upwards of 2½ acres at Wembley Park and forwarded approximately 160 hampers and 60 sacks of vegetables to various hospitals. The Rifle Club Section have had good practice and out of the 88 members, 14 have lately joined the Colours, while the Women's Red Cross Section have made at least 750 attendances at various hospitals, and most of the students have secured First Aid certificates. The Sewing Class for Soldiers and Sailors garments has been busy and the provision for Sailors and Soldiers Free Buffets has been well looked after. In addition to the various sections of work of the Voluntary War Service Corps, a War Savings Association has been formed and up to the present time there are 1,630 members and more than 15,550 certificates have been bought. The Sports Section of the Corps had a meeting at Wembley Park in July last and made a profit of over £230, out of which comforts and parcels were sent out to the Front to employees of the "Met." serving with the Forces, particularly to those members of the Staff who are now prisoners of war in Germany. Altogether the meeting was a successful one and reflected great credit on the members of the Metropolitan Railway Staff, who for several reasons are not able to take a more active share in the war.

* * *

WE regret to announce the death on March 13th last of Sir Myles Fenton at Redstone Hall, Redhill, in his eighty-eighth year. He was born at Kendal, and educated there, beginning work on the local railway at the age of fifteen. After service on the East Lancashire, Eastern Counties, London and South Western, and other lines, he became secretary of the East Lancashire Railway in 1856, general manager of the Metropolitan in 1863, and of the South Eastern in 1880, and consulting Director of the South Eastern and Chatham in 1898. He was knighted in 1889, and was a Chevalier of the Legion of Honour of France, an officer of the Order of Leopold of Belgium, and lieutenant-colonel of the Engineer and Railway Volunteer Staff Corps. Sir Myles was a direct annual subscriber to the RAILWAY MAGAZINE from its inception.

* * *

THE RAILWAY MAGAZINE is given to understand that discussions are now taking place between the Railway Executive Committee and the Government with reference to measures to be taken to meet the pressure on the traffic resources of the railways. The problem has had to be considered ever since war conditions added to the work done while diminishing the means for handling traffic. Large withdrawals of rolling stock for use abroad and the shortage of labour are coincident with constant movement of troops and a diversion of coastal traffic to land transport. Movements connected with the receipt and distribution of food have raised new difficulties, and increased the necessity for reducing other movements on railways. It may be taken for granted that the Railway Executive Committee will interfere as little as possible with such transport and travel as is required to carry on business. Excursion facilities have been discontinued, and duplicate trains have been cut down. The question of issuing "permits" has been considered; but the labour and annoyance connected with the establishment of such a system are recognised. A stoppage or restriction of the issue of season tickets has been suggested, but does not find favour. That less drastic measures will be adopted as a result of present negotiations may be taken for granted, and the public must face with resignation such modifications in travel facilities, including reductions of speed, as may be found unavoidable. In view of the fact we are in the midst of a world shaking war the way in which British railways continue to "carry on" is little short of marvellous, and is indeed highly creditable.

* * *

ON March 15th the London and North Western Railway steamer *Rathmore* was in collision with a naval boat. Six hundred and forty passengers, mainly military, were taken off by destroyers and landed at Kingstown. Several passengers were reported missing and twenty of the survivors were injured. The *Rathmore* did not sink, but was towed to Dublin. This well-known boat was built in 1908.

* * *

IN 1917 the London and South Western Railway carried nearly 10,000,000 more suburban passengers than in 1915. The electric trains have proved so popular that it is now practically impossible to get a house in the districts served by them.

* * *

THE humble herring means something to the Great North of Scotland Railway. Last herring fishing season, from the middle of June to the middle of September, it involved 406 special trains, the use of 8,830 trucks, and a total weight carried of 22,928 tons.

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At the recent Isle of Wight Central Railway annual meeting, Mr. Harry Willmott, Chairman, mentioned that last year they sold one of their locomotives, now unsuitable for their railway, at a fair price. Since then they had sold two further locomotives, one a very small one taken over from the contractors when the railway was made and not capable of dealing with their present heavy traffic, and the other was purchased 12 years ago to run with a carriage as a motor train, and was unsuitable for their present traffic.

* * *

In 1917 the Great Central Railway handled a passenger traffic to the number of 22,069,508 compared with 21,216,847 in 1913. Excluding all tonnage carried on Government account, the merchandise traffic in 1917 was 20,330,132 tons as against 21,055,543 tons in 1913. These colossal traffics have been carried with hardly a hitch, and certainly no inconvenience to the general public.

* * *

At the recent annual meeting of the proprietors of the North London Railway, the Chairman, Lord Rathmore, expressed the disappointment of the shareholders at the non-completion of their electrification scheme, or rather the larger scheme for the electrification of the London and North Western suburban lines, which were closely connected with their own. So far as the North London Railway was concerned, the electrification was practically complete, and they had run a service between Broad Street and Kew and Richmond since the beginning of April, 1916, but the service had been restricted for want of rolling-stock. The increase of 50 per cent. in fares had also militated against them. Some progress had been made during the year towards the completion of the larger scheme, and the electrification of the North Western line had been completed between Watford and Queen's Park. A morning and evening service had also been run between Watford and Broad Street. Unfortunately, the electrification between Queen's Park and Chalk Farm was still incomplete, and there seemed little probability of its being completed before the termination of the war.

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For a new signal-box and sidings at Currock, the directors of the Maryport and Carlisle Railway have put aside to spend on capital account £1,000. They have also put aside £4,500 for renewals on rolling stock.

* * *

Major N. B. Foster is to read a paper, the subject of which will be "Railway Restaurant Cars," at the monthly meeting of the Railway Club, 92, Victoria Street, London, S.W., 7 p.m., Tuesday, April 9th. At the March monthly meeting an animated discussion followed the production of a paper by Mr. J. B. Sherlock on "The West Highland Railway." Mr. Sherlock was unavoidably absent but the paper was read by Mr. H. L. Hopwood and Mr. J. C. Cosgrave. At the same meeting—the chair being occupied by Mr. Edwin J. Miller, the Club's Honorary Secretary—five new members were elected. Three of them are Londoners, while two reside in the provinces. Two of the new members are serving in His Majesty's forces.

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On March 16th the Railway Club had their first 1918 visit. This was to the Dalston Works of Messrs. Tyer and Co., whose Electro-Mechanical Works were inspected. Mr. J. W. Punter, General Manager (a member of the Club), received the party and with his able assistants escorted the party through the works, and described the different apparatus manufactured. The most interesting were the "One Wire Three Indication Instrument" for double line signalling, the "Permissive Indicating Block Instrument" and the "Signal Light Indicator," the latter describing to the signalman the condition of the signal light, when the same is out of vision. Of the first mentioned apparatus a modification of the working was shown on a new pattern instrument, a large number of which are destined to the military railways in war areas.

* * *

A somewhat epoch-making change has recently taken place on the Great Northern Railway as regards the piloting of trains, this practice having at last extended to express passenger trains. On a number of occasions since the beginning of March the 5.30 p.m. down Newcastle, Leeds and Hull express has been piloted out of King's Cross, the leading engine being one of the rebuilt 4-4-0's of the 400 class, and the train engine as usual a superheater "Atlantic," with a load of 17 eight-wheelers. Prior to this, the only passenger train to our knowledge ever piloted on the Great Northern Railway of recent years was the 5.0 p.m. *ex*-King's Cross, the train engine taking the fast Cambridge portion forward from Hitchin, and the pilot the slow portion for Cambridge; the Essendine section was taken on by an engine standing at Hitchin. War-time conditions are putting an end to many railway "traditions."

* * *

With reference to the article on Great Northern Railway 2-6-0 type locomotives, which appeared in the March Railway Magazine, we are asked by Messrs. Newalls Insulation Co., Ltd., of Newcastle-on-Tyne, to say that the lagging used for the boilers of these engines is that known as "Newallite Slabs," consisting of 85 per cent. pure carbonate of magnesia with 15 per cent. of asbestos fibre added to give the material the necessary binding properties. The slabs are much lighter than asbestos mats. The illustration on page 146 showed one of the boilers with the lagging exposed.

* * *

In reply to a question from a correspondent as to how many of the late Mr. F. W. Webb's 5 ft. 4-6-0 4-cylinder compound goods engines were built, and how many still survive, Mr. C. Williams writes from Crewe: "The London and North Western Railway 4-6-0 type of compound

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goods engine was introduced in 1903, and was the last type of locomotive designed by Mr. Webb for that company. In all, 30 of these engines were built—5 in 1903, 15 in 1904, and 10 in 1905. At the present time only 4 of the class still remain, their numbers and sheds being as follows:—No. 504, Bescot; No. 1113 and 1407, Llandudno Junction; and No. 2059, Holyhead.

* * *

MR. WILLIAMS has also furnished some further information in reply to the same correspondent, who asked whether certain of the "Precursor" class engines on the London and North Western Railway had been superheated without the customary extension of the smoke-box, and, if so, whether the superheater was of the usual pattern and how such engines can be distinguished. In this connection Mr. Williams states that the superheater fitted is of the usual pattern, and that the only distinguishing feature of these engines, as compared with the ordinary "Precursors," is the rod operating the dampers, which passes along the left side of the boiler. Out of 29 "Precursor" class locomotives converted to superheater engines, only three have been so treated, or, as it is known officially, superheated without rebuilding—No. 302, *Greyhound*, No. 323, *Argus*, and No. 1309, *Shamrock*. The first-named is stationed at Rugby and the two latter at Crewe.

* * *

A NOTEWORTHY piece of information comes from Mr. J. W. B. Tunstall, to the effect that No. 986, one of the latest London and North Western Railway 4-cylinder 4-6-0 "Claughton" class engines is at present working on the Leeds express leaving Liverpool at 10.50 a.m., engines of this type not having previously worked on the Yorkshire section. Formerly, Mr. Tunstall continues, this train was worked by a "George the Fifth" class engine, and was to his knowledge the only train on this section worked regularly by an engine of this type, of which none are now stationed at Leeds, although several of the 4-6-0 "Prince of Wales" class engines are stationed there. As regards the latter, and in reply to Mr. Robbins' query on this point in the February RAILWAY MAGAZINE, Mr. J. H. L. Reeves sends a complete list of the "Prince of Wales" engines stationed at Leeds, as follows:—No. 173, *Livingstone*, No. 401, *Zamiel*, No. 479, *Thomas B. Macaulay*, No. 810, *Onyx*, No. 877, *Raymond Poincaré*, No. 1134, *Victor Hugo*, No. 1379, *Witch*, No. 1484, *Smeaton*, and No. 2213, *Charles Kingsley*, nine in all.

* * *

MR. G. C. HARTLEY writes for the benefit of those interested in North Staffordshire Railway doings to the effect that North Staffordshire Railway engine No. 115, one of the new 0-6-4 tanks, is now frequently hauling the mid-day London express from Manchester as far as Stoke. This engine has cylinders 20 in. by 26 in., pressure 160 lbs. per sq. in., heating surface 1,274 sq. ft., and drivers 5 ft. 6 in. diameter; one of its sisters, No. 114, was the subject for the colour plate some time ago. Recently, on this express, it took a train of no less than 420 tons tare, filled with passengers, so that the total weight could not have been less than 450 tons.

* * *

MR. DAVID L. THOMSON, of Old Aberdeen, communicates as follows:—Three new 9-6-0 goods engines have appeared on the Caledonian Railway. They resemble the 1912 or "30" class, but are not fitted with superheaters. The numbers are 300-303, and the two first have been observed at Perth. They are peculiar in that steel fireboxes are used, an innovation on this railway. Nine others are under construction at St. Rollox, but owing to shortage of material will not appear for some time. Three new 4-6-0's are in evidence on the Highland Railway, names and numbers being 50, *Brodie Castle*, 58, *Darnaway Castle*, and 59, *Foulis Castle*. They are fitted with superheaters. The driving-wheel diameter is increased to 6 ft., but otherwise they resemble the "26-29" class of 1913; the new engines, which are dated "North British Locomotive Company, Queen's Park Works, 1917," are, however, fitted with six-wheeled tenders lettered simply "H.R." Nine engines of the "Snaigow" 4-4-0 class are under construction.

* * *

WITH lines running both to Camp Grant, Illinois, and the Great Lakes Naval Training Station, the Chicago and North Western Railroad carries more sailors and soldiers in and out of Chicago than any other line. Recognising that its Chicago terminus was an exceptionally large gathering point for these men, the company decided that it was the logical situation for recreation rooms and a social service bureau for them. Many of the soldiers and sailors are strangers in the city, and are exposed to the dangers growing out of chance acquaintances and unfortunate environment encountered in the quest for entertainment. It was with the idea of furnishing them with wholesome recreation and suitable companions that a social service bureau was opened in the station for the registration of soldiers and sailors. Each man who desires to do so may leave his name with the social service attendant, stating the time he will be in Chicago and the length of his stay, even though it be only for an hour. Citizens, on the other hand, who desire to extend their friendship to service men are asked to notify the bureau when they can entertain a soldier or a sailor and how. Both parties are brought together in this manner and the soldiers and sailors are provided with wholesome entertainment, whether it be a dinner, a dance or a theatre party. For the entertainment and comfort of the men while waiting for trains at the terminus the North Western has provided recreation rooms containing comfortable chairs, reading and writing materials, music in the shape of a piano-player and a piano, porcelain bath tubs and shower baths, and an up-to-date lunch counter at which meals can be obtained at the lowest possible prices.

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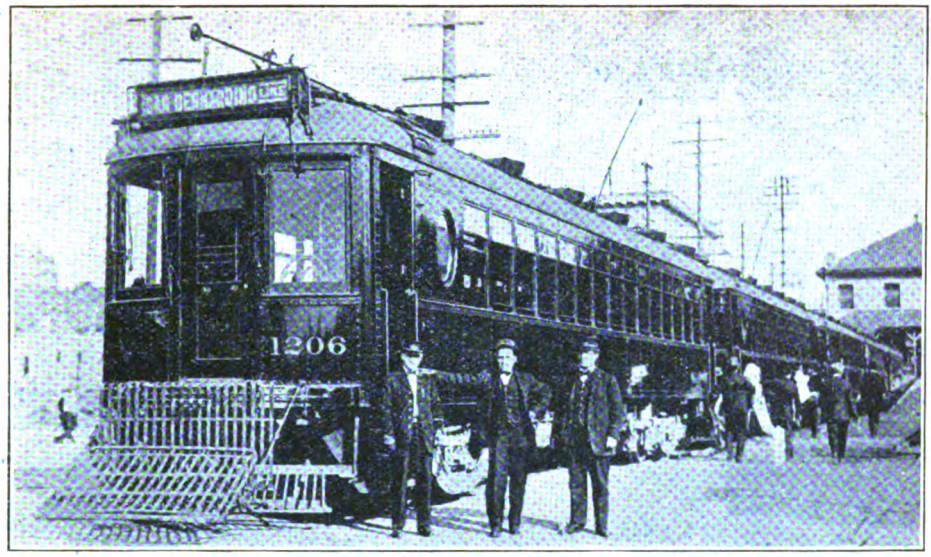

1200 CLASS STEEL INTERURBAN TRAIN.

The Pacific Electric Railway.

By R. W. A. SALTER.

IN the RAILWAY MAGAZINE, February, 1917, a contribution was published dealing with the Bay State Street Railway of Boston, U.S.A. The author of the article stated that by reason of certain traffic conditions peculiar to the United States electric railways of the type described—combining characteristics usually associated with tramway operation—were constructed as being essentially useful for local train services and the transport of goods. In the following article a description is given of the Pacific Electric Railway, which is the largest of such systems and has many features of quite a novel character.

For the benefit of readers a brief recapitulation of the history of Los Angeles as centre of this encompassing interurban electric railway system may not come amiss. It dates from the year 1893, when the first line to Pasadena was established. Later, and at intervals of a few years, other lines radiating in all directions to the more important points were carried out by different companies and worked by them individually until, in 1911, they were consolidated with the Pacific Electric Railway.

The total mileage is 1,078—standard gauge. Save within city limits lines are laid on private rights of way, and the road-bed, track and roadway structures closely follow steam railway standards.

The Pacific Electric Railway operate street car service in Los Angeles, Pasadena, Pomona, San Bernardino, Redlands, Riverside, Santa Ana, Long Beach, San Pedro, Santa Monica, Ocean Park and Venice.

Electrical energy is supplied by the Southern California Edison Company in the form of alternating current, 50 cycles, 15,000 volts, at 12 delivery points, and from these main delivery points is distributed to 44 sub-stations. At the sub-stations the energy is stepped down to 2,200 volts alternating current by transformers and then converted to normal trolley voltage—575 volts direct current—by motor generator sets. There are exceptions to this procedure in several of the stations where has been installed a later type of machine, whose motors, built to withstand 15,000 volts alternating current direct, dispose of the necessity of transformers. On a section of the San Berbardino–Riverside line between Covina Junction and San Bernardino the normal trolley voltage is 1,200 volts.

The scenery encountered on the railway is varied by long stretches of valley and rolling foothills, by mountain ranges with pine-clad summits, and by a coast-line 60 miles long. The nature of the country

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surrounding Los Angeles is extremely diversified: to the west and south are a large number of beach resorts; to the north agricultural territory, suburban residence and mountain resorts; while to the east, north-east and south-east lies the great citrus belt of Southern California.

Some variance exists in the fares on different parts of the system, which were established by the various companies prior to amalgamation. As a general rule, single and return tickets are issued between all points, as well as season tickets which are sold at low rates and have been the most potent factor in building up the territory adjacent to the lines. Conductors sell return tickets and collect single fares at the regular rates; excursion tickets, however, are not purchasable from conductors on trains, but must be obtained at ticket offices.

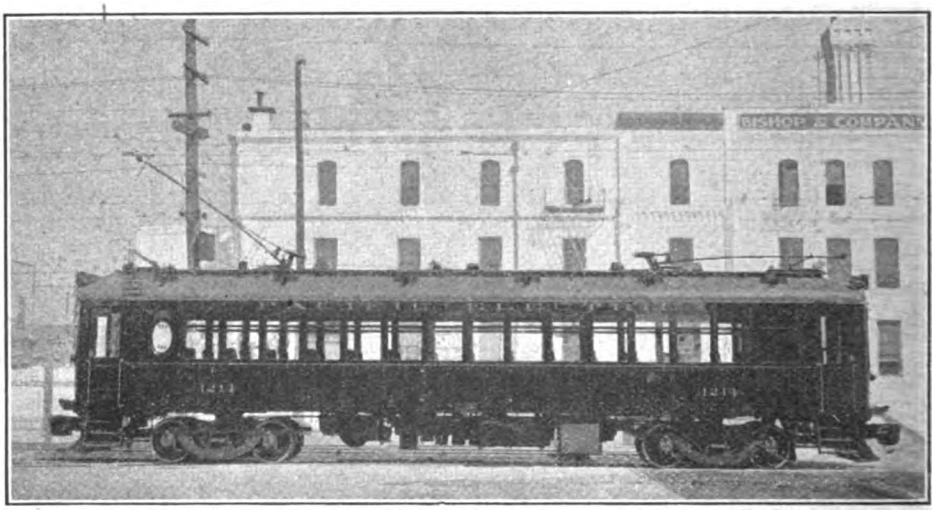
In interurban services the Pacific Electric Railway run daily 2,800 trains, made up of one, two, three, four or five cars; 5,000 trips are made daily by city cars.

There are several classes of passenger car in use. Interurban cars are equipped with four motors, multiple unit control. The latest type is the 1200 class, all-steel, in service on the Los Angeles–San Bernardino–Riverside line (65 miles long). These cars have four 140 h.p. motors geared to a speed of 60 miles per hour; automatic tight-lock couplers making air-brake, electrical and mechanical connection between cars; weigh 108,000 lbs. completely equipped, and accommodate 60 passengers.

The 1300 class are combination passenger and baggage or passenger and post-office mail cars. The seating capacity varies from 24 to 32 passengers, the weight from 30,000 to 49,000 lbs., and the motors from 43 to 52 h.p.

The 1000 class are run on the Pomona, Long Beach and Santa Ana lines; have a seating capacity of 64, weigh 81,000 lbs., and are equipped with 100 h.p. motors. They will run on either 600 or 1,200 volts.

The 800 class cars are used mainly on the Venice Short line, San Pedro and Redondo Beach lines. These can be worked only on 600 volts, and, though of similar construction, are somewhat lighter than the 1000 class. They weigh 70,400 lbs. complete, and the motors are 70 h.p.



ALL STEEL CAR IN USE ON SAN BERNARDINO RIVERSIDE LINE.
Operated in three trains.

Cars of the 700 class are worked over the lines between Los Angeles and Pasadena. They weigh 74,800 lbs., seat 56 passengers, and are equipped with 74 h.p. motors for 600-volt operation.

The 500 class are used on the shorter lines like the Burbank, Alhambra–San Gabriel and Glendale. Weight complete is 58,500 lbs. There is seating capacity for 48, and the motors are 52 h.p.

Cars of the 400 class are worked principally on a number of local lines running through Los Angeles to points not far distant.

In the city services there are three types of car. The 200 class are provided with open sections at each end and a closed compartment in the centre. They seat 44 passengers, and have 57 h.p. motors. Another class of

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city car is the 170 series, an all-steel, "low-centre-entrance" type, now running in Pasadena and Altadena. These have a seating capacity of 54, four motors of 50 h.p. each, and weigh 60,500 lbs. The 160 class cars are similar in construction to the 200 class, having an open section at either end with closed compartment in the centre.

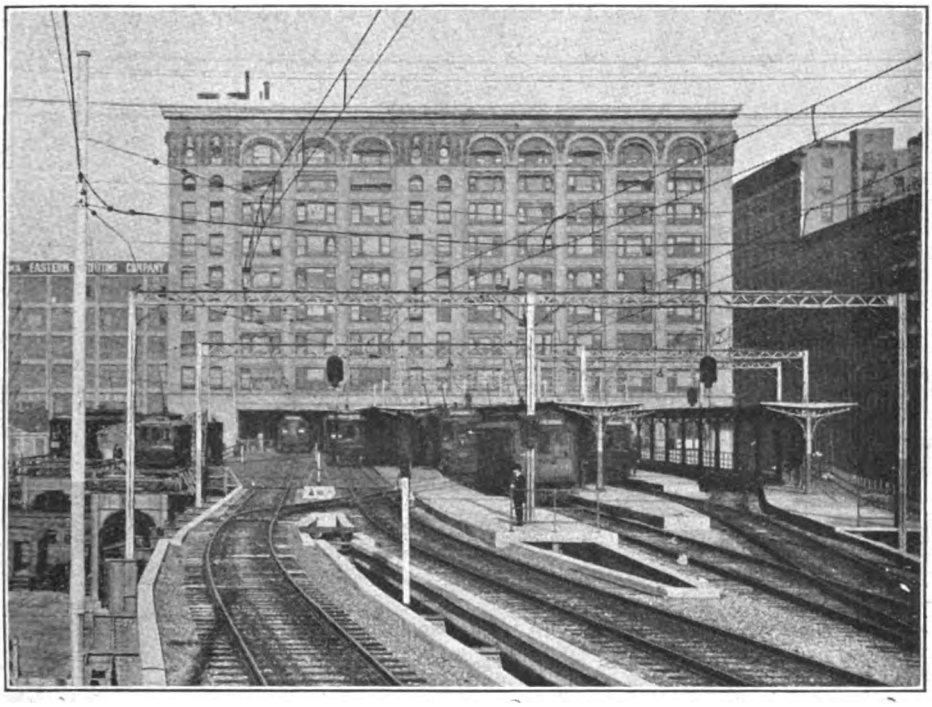
All the interurban cars are practically half open and half closed, the open compartment having no window sashes or doors. The seats in the closed portion are plush, while those in the open section are wooden.

Freight equipment of the system numbers 2,000 cars and 50 freight motors. The freight cars are constructed to regular American steam railway standards. There are several types of electric freight motors, which weigh from 52,000 to 127,750 lbs., the heavier motors being capable of hauling a loaded train of 30 cars.

Transcontinental as well as local freight is handled. Through billing and interchange is made with two of the three steam lines entering Los Angeles and physical interchange with the third.

The largest freight terminus is in Los Angeles. It consists of freight yard, wagon roads, an outbound depôt 50 by 580 ft., and an inbound depôt 50 by 350 ft. An average of 56 cars of "less than carload" merchandise is handled daily at this terminus. During December last year 2,138 car-loads of freight for Los Angeles proper were received and forwarded from the depôts, while 5,212 car-loads on foreign line billing passed through the terminus, making a total of 7,350 car-loads handled.

Wells–Fargo and Company are under contract to operate express business over the system. This requires something like 50 express cars daily.



LOS ANGELES.

Rear view of Main Street station showing elevated tracks.

Waiting stations have been erected at a great many points on the system. They range from small shelters to complete passenger stations in every detail. Owing to the consolidation of the several lines there are different types, but the more recently erected are concrete.

In Los Angeles the main passenger station of the Pacific Electric Railway occupies the ground floor of the Pacific Electric building, a nine-storey concrete and steel structure, built in 1905 at a cost approximating £350,000. It is served by seven elevated lines at the rear of the building. In all there

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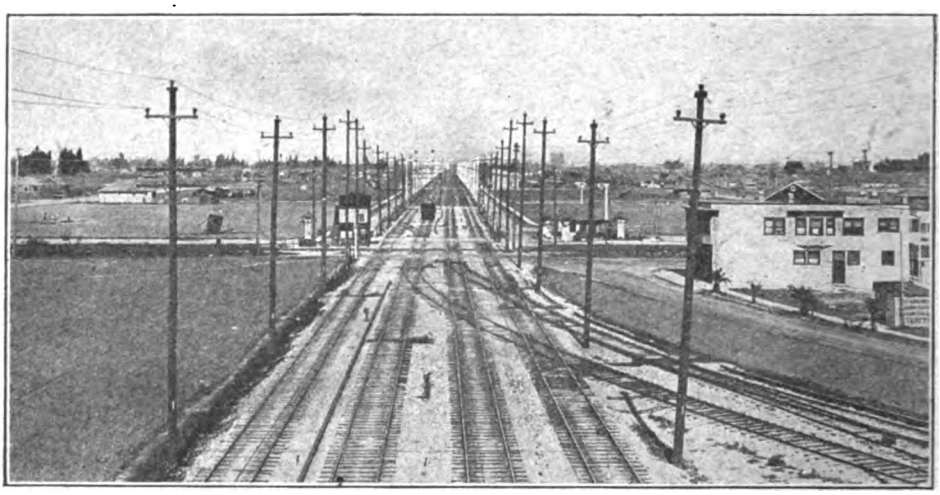
are 1,290 scheduled trains in and out of the station each day of 20 working hours. Pasadena Short line and Oak Knoll line trains enter the building from Main Street on loop tracks, and after unloading leave by the elevated lines alluded to. The San Gabriel, Sierra Madre and Sierra Vista trains run through the station in the reverse direction. Save for a few other trains and excursion trips, every train enters and leaves over the elevated lines. Train movements are controlled by an electro-pneumatic interlocking plant equipped with a 23-lever vertical roller type machine. Passengers enter trains through gates at the rear of the waiting room over a concrete arch leading to the platforms. The latter are covered with "umbrella" roofs. The exit for passenger leaving trains is by a ramp running under the main waiting room floor and emerging at a point in the lobby.

The other passenger station in Los Angeles is situated on Hill Street and forms the terminus of lines running to the beaches on the coast, Hollywood, San Fernando and Owensmouth.

One hundred and fifty automatic block signals, "three-position colour electric light" type, are now used on some of the lines where traffic is heavy. It is the intention ultimately to place them over the entire system.

The principal junction points are controlled by electric interlocking signal plants. A plant with 73 working levers, at Watts, is the largest. An average of 1,525 trains pass this point daily.

New shops at Torrance, covering 60 acres, are in course of construction, and will be completed when this article appears in print. The 15 shops, costing approximately £300,000, are being equipped with modern devices and machinery, and employment is to be found for 1,000 workers. In addition to general repair work, it is anticipated that both passenger and freight cars will be built there. Repair shops at San Bernardino are also under way, at a cost of about £10,000. At Macy Street, near Echandia Junction, there has recently been constructed an inspection and repair shed which has eight tracks 152 ft. in length. At this point, besides, a storage yard to accommodate 200 cars has been provided. A similar shed and storage yard is situated at Watts, and smaller sheds and storage yards at different points along the system.



FOUR-TRACK LINE AT SLAUSON JUNCTION.
Local trains use outside and through trains inside tracks.

The Pacific Electric Railway is divided into three divisions.

The Northern Division has 22 lines extending from Los Angeles to San Bernardino, Redlands, Riverside and Corona (the great orange growing district) on the east, and to Pasadena, Mount Lowe, Burbank, Glendale and San Gabriel on the north; and city lines in Pasadena, Redlands, Riverside and San Bernardino.

The Southern Division is comprised of 17 lines serving the territory lying south and south-west of Los Angeles, including the

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cities of Long Beach, San Pedro (Los Angeles harbour), Redondo Beach, Newport Beach, Santa Ana, Whittier and La Habra.

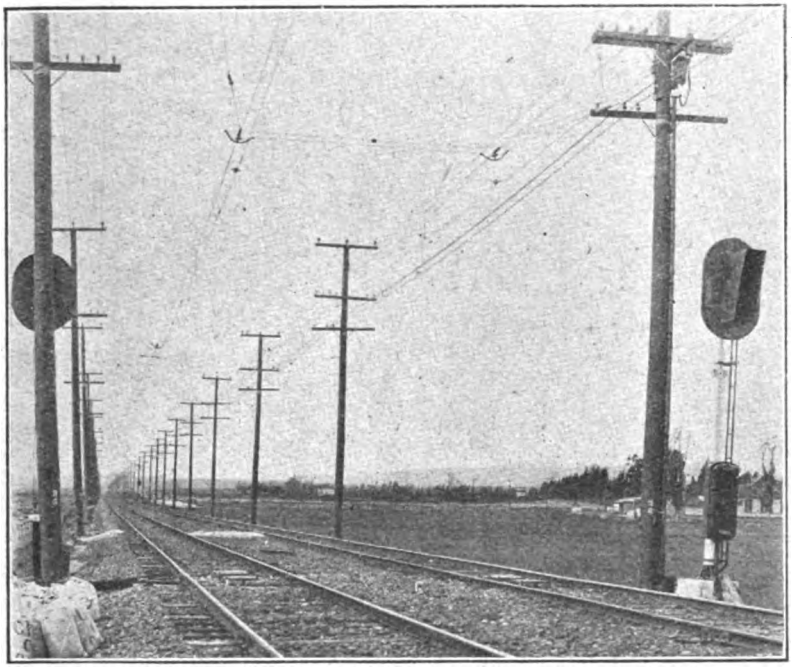
The Western Division is made up of 12 lines serving San Fernando Valley points, Hollywood and the seaside resorts Santa Monica, Ocean Park, Venice and Redondo Beach.

Each division has three shifts of two dispatchers per day. All dispatching is done by telephone; the instruments being magneto type. The dispatcher's board was made at the company's shops and is equipped with electric drop signals.

seats. While tourists visit Los Angeles each year and revenue comes from this travel, the main source is derived from the public residing on the outskirts of Los Angeles whose business or employment require them to make daily or frequent journeys to the city.

The Balloon Route trip, drawn attention to in the preceding paragraph takes a course parallel to the mountains from Los Angeles to the sea, then 28 miles along the ocean shore, visiting several pleasure beaches. The fare is 4s.

Orange Empire trip costs slightly more—



VENICE SHORT LINE.

Here is shown track construction and type of three-colour electric light block signal used.

The Pacific Electric Railway derives by far the greater amount of its revenue from passenger traffic. Freight traffic has increased each year, and now amounts to nearly 25 per cent. of the gross revenue.

The population of Los Angeles and the territory tributary to the lines served by the railway is estimated to be 850,000. During the past year the number of passengers handled was, roughly, 76,000,000.

Three sight-seeing trolley trips—Balloon Route, Old Mission and Orange Empire—have been organised. Each trip is personally conducted in parlour cars with reserved

7s.—including side trips. The car leaves Pacific Electric Railway Building at 9 a.m. and passes out through a region given to orange growing. At Riverside it runs in view of Mount Rubidoux, crowned by the Junipero Serra Cross, to Sherman Indian school. After being conducted through the school, the party returns to the Mission Inn, where time is given for an inspection of this hostelry.

Old Mission trip, through San Gabriel Valley, is of equal interest.

Another tour which attracts many tourists is that to Mount Lowe. Starting

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from Pacific Electric Building, the course lies through the wholesale and jobbing district of the city, skirting then Eastlake Park and climbing in sweeping curves the divide between Pasadena and Los Angeles, reaching the summit at Oneonta. The line winds among the great shoulders of the mountains until suddenly it plunges into the depths of Rubio (2,200 ft. above sea-level), where it terminates. An incline railway lies straight ahead up the side of Echo Mountain, an ascent of 1,300 ft. in a distance of 3,000 ft. The incline cars seat 28 persons and are permanently attached to a steel cable tested to 100 tons. Electric machinery for working the incline is situated at the top. An electric line climbs another 1,500 ft. to Alpini, but on this the grades rarely exceed 7 per cent.

As regards freight traffic, one of the principal sources is gained from the transport of citrus fruits. A great deal of oil is handled from the Whittier–La Habra and Sherman districts, which are classed among the greatest oil fields in the world, to the refineries; and from 50 to 60 cars of oil are hauled daily from the immense refinery of the Standard Oil Company at El Segundo to Los Angeles. The Santa Ana line taps a sugar beet district. Other freight traffic comes from the shipment of vegetables over the entire system; beans, sugar beets and deciduous fruits from San Fernando Valley points; lumber and merchandise from the steamship docks at Redondo Beach, San Pedro and Wilmington.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—
L. & N.W.: Jan., Feb., March, May, 1915. (All out of print except May.)
Great Northern: June, July, 1915. (Out of print.)
M.S. & L.: Aug., Sept., Oct., 1915. (Aug. out of print.)
Great Western: Nov., Dec., 1915. Jan., Feb., March, April, May, June, July, Aug., 1916. (Jan. [out of print.)
Glasgow & S.W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916; Jan., Feb., March, April, May, 1917. (Jan. out of print.)
South Eastern: June, July, Aug., 1917.
Lancashire and Yorkshire Railway: Sept., Oct., Nov., 1917.
London, Chatham and Dover Railway: Dec., 1917; Jan., Feb., 1918.
Caledonian Railway: March, April, May, 1918.

In June, 1918, Mr. Ahrons will continue to deal with the Caledonian Railway.

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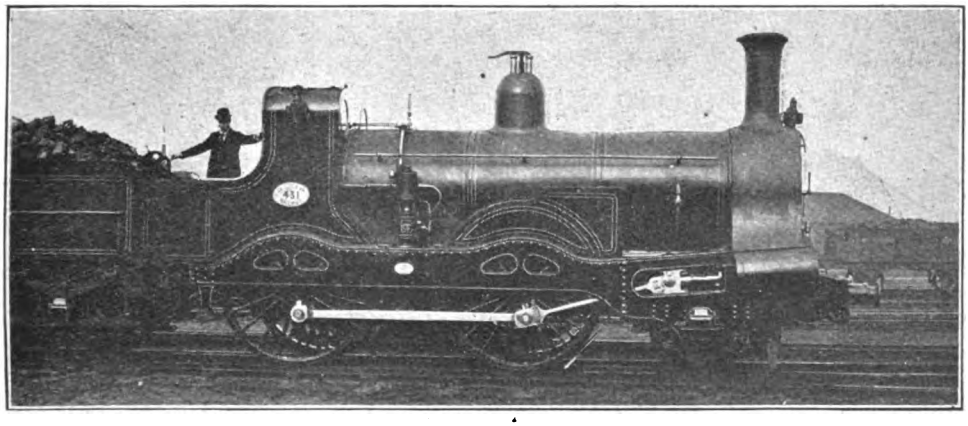
Locomotive and Train Working in the latter part of the 19th Century.

CALEDONIAN RAILWAY. [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

AFTER the close of the year 1882 a complete and drastic change took place in the design of the Caledonian locomotives which had hitherto remained faithful to the early types of 1848, modified, of course, as to size. The curtain was rung down on the outside cylinder stage, and the new conditions held good until the closing months of 1916, when outside cylinders reappeared under the ægis of the new chief locomotive engineer, Mr. Pickersgill. The 1882 change was due to the arrival on the scene of Mr. Dugald Drummond, who came over from the neighbouring North British Railway works at Cowlairs. Mr. Drummond speedily found that the existing express train loads had gone ahead of the power of the locomotives, and in order to ease the situation he took a number of the existing express goods engines with 6 ft. 2 in. wheels and 18 in. by 24 in. cylinders, and rebuilt them with new boilers for use on main line and other heavy passenger trains. As thus rebuilt their appearance was greatly improved. The splashers were closed, new chimneys of a much more sightly appearance than the old plain ones, and also new cabs were added, and the Ramsbottom safety valves were placed on the top of the dome in accordance with Mr. Drummond's early practice. The engines thus rebuilt in 1883–5 were Nos. 417 to 436 and 473 to 484, and their places on main line goods trains were taken by new six wheels coupled goods engines of Mr. Drummond's design.



Photo] [*Locomotive Publishing Co., Ltd.*

2–4–0 EXPRESS GOODS ENGINE, NO. 431.

Rebuilt by Mr. Drummond as a fast passenger locomotive. Class 417 to 436, 472 to 483. Wheels, 6 ft. 2 in. Cylinders, 18 in. by 24 in.

For express trains their use must be considered as in the nature of a "stop-gap." Amongst their earliest work was the down "Limited Mail" from Carlisle, piloted though by an 8 ft. single, and the easy regular beat of the latter compared with the continuous roar of the "420" was very marked. For a time they were not very popular with the men for expresses, but in later years they did a great deal of very useful work on secondary fast and passenger trains. When Mr. Drummond's new 4–4–0

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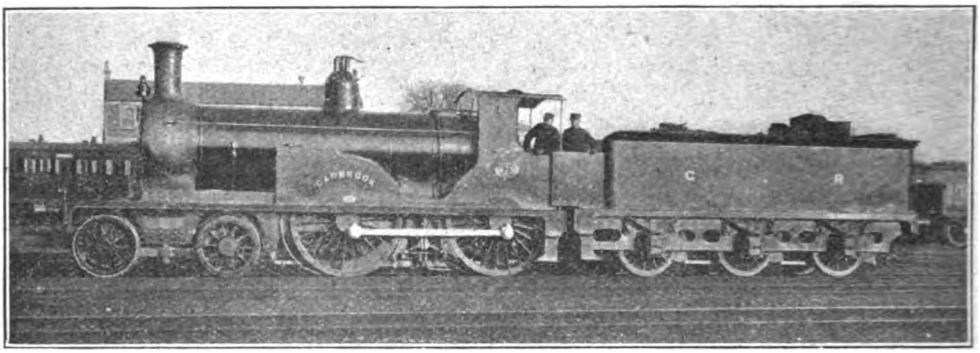

Photo] [*Locomotive Publishing Co., Ltd.*

DRUMMOND ENGINE, NO. 79, *Carbrook*.

Built at St. Rollox Works, 1889. Wheels, 6 ft. 6 in. Cylinders, 18 in. by 26 in.

express engines came out in 1884, the heavier trains were allotted to the latter, but some of the lighter Edinburgh expresses from Carlisle were worked by the rebuilt 420's. At that time the best Edinburgh express was allowed 2 hours 20 min. for the 100¾ miles, with stops at Lockerbie and Beattock, and on this train Mr. Rous Marten recorded a run with 422 and a load of 140 tons, on which the 25¾ miles from Carlisle to Lockerbie was covered in 32 min., and thence to Beattock start to stop, 14 miles, in 17½ min. From Beattock up the 10 miles of 1 in 75 and 1 in 80 to the summit took 18½ min., but the downhill run thence to Strawfrank Junction, 23½ miles, took 27½ min.

Until the end of the 19th century one of these engines was usually used to pilot the heavy 2.0 p.m. diner from Glasgow in front of one of Mr. McIntosh's "Dunalastairs" as far as Carstairs, where it came off, and No. 479 was very often to be seen on this service.

I do not think that any of the other four-coupled express goods engines of the same class were rebuilt as passenger engines. The early ones of 1858 to 1864 were broken up before the end of the century, and the later ones were mostly taken out of service by Mr. McIntosh.

In 1884 the first series of Mr. Drummond's inside cylinder 4–4–0 express engines made their appearance from the works of Messrs. Neilson and Co. There were ten of the class Nos. 66 to 75, very similar to the dozen express engines which the same engineer had put to work in 1876–8 on the North British Railway, though the heating surface in the Caledonian engines was about ten per cent. greater. The cylinders were 18 in. by 26 in., the coupled wheels 6 ft. 6 in., and the total heating surface 1,208·6 sq. ft. The grate area of 19 sq. ft. showed a considerable increase over that to which the Caledonian men had been accustomed, for hitherto the grates had been of exceedingly small proportions. The boilers were pressed at 150 lbs. per sq. in.

Omitting No. 124, an engine of which the details were somewhat different, there were 28 of these fine engines built as follows :—

66 to 75	Neilson	1884
60 to 65	Caledonian Railway	1885
76 to 79, 84 and 87	,, ,,	1889
83, 88 to 91, and 113	,, ,,	1891

Of these, No. 79 rejoiced in the name *Carbrook*.

The 1889 and 1891 series took the old numbers of the 8 ft. singles which were now relegated to comparative obscurity, and the 1889 engines were the first on the Caledonian to have steel boilers. These were constructed for 200 lbs. working pressure, but were worked at 150 lbs. only in service.

The other Drummond engine, No. 124, built by Dübs and Co. in 1886 and exhibited at the Edinburgh Exhibition of that year, was as regards wheels, wheelbase, and boiler very similar to the others, but the cylinders were 19 in. by 26 in., and it was fitted with a new form of radial valve gear, a sort of distant relative of the Joy in that it had a link attached to the connecting rod, but it also claimed a sort of connection with the Walschaert, in that part of the movement was derived from the crosshead. This gear was the invention of Mr. Bryce Douglas, of the Fairfield Engineering Co., and was fitted to various marine engines. There seemed to be rather too many pins about the arrangement for a locomotive, especially a high-speed express engine, so that it was not

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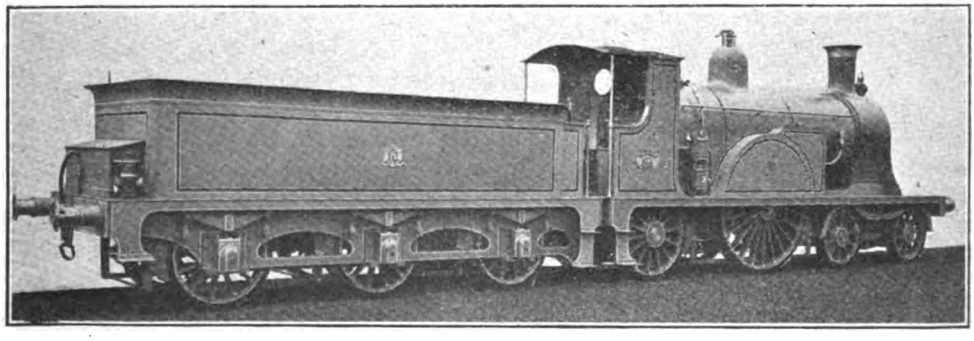
surprising to learn that after considerable trial* the gear was subsequently removed, and the engine, then provided with the standard 18 in. cylinders, was assimilated with the rest of the 60 class, with the valves between the cylinders instead of on the top as had previously been the case. This engine was subsequently named *Eglinton*, and in its altered condition did very good work. It was afterwards stationed at Perth for some time.

There was one other Drummond express engine that merits special mention, viz., the celebrated single-driver express engine No. 123, which was the only 4–2–2 engine that the Caledonian Railway ever possessed. Built in 1886 by Messrs. Neilson and Co., it was exhibited at Edinburgh the same year, and then put to work on the "West Coast" expresses from Edinburgh to Carlisle and back. No. 123 had 7 ft. driving wheels, 3 ft. 6 in. bogie wheels, and 18 in. by 26 in. cylinders. The boiler carried 150 lbs. pressure and had a tube heating surface of 950 sq. ft., to which the firebox added 103 sq. ft., giving a total of 1,053 sq. ft. The weight in working order was nearly 42 tons, of which 16 tons were carried on the driving wheels. Of the work which this fine engine performed on the Scotch racing trains of 1888 I shall write below, but when the subsequent 1895 racing trains to Aberdeen were running, No. 123 was used only on the final day, as these trains in the earlier days of the race between Carlisle and Perth were considerably heavier. For a considerable time after the conclusion of the 1888 race, No. 123 still stationed at Edinburgh, ran daily with the 10.0 a.m. day Scotch express to Carlisle, returning with the corresponding down express in the afternoon. The speed was of course reduced, but the trains were much heavier, and the engine did excellent work. Then 123 was removed from Edinburgh to Carlisle shed and worked expresses between Carlisle and Glasgow. For a long time it made the journey twice each way, a daily mileage of 409 miles. At a still later date, owing to alterations in engine workings, 123 was removed to Perth and ran some of the expresses between there and Aberdeen for some years, and it was during this period that the engine made its one appearance on the last night of the 1895 race. Two or three years ago it was renumbered 1123, and for about twelve years it has been employed to run the Directors' saloon in place of the old tank engine No. 1.

Mr. Drummond also built at St. Rollox twelve 4–4–0 engines with smaller driving wheels for the Glasgow and Gourock boat train traffic. These were Nos. 80, 81, 82, 85, 86 and 116, built at St. Rollox in 1887–8, followed by six more, Nos. 114, 115 and 195 to 198 in 1891. These twelve engines had 18 in. by 26 in. cylinders, coupled wheels 5 ft. 9 in. diameter, and a heating surface of only 936½ sq. ft. Nothing further need be said about them; they have always, as far as my knowledge goes, been employed upon the "Coast" train services from Glasgow.

By the end of 1885 there were 16 of the main line 6 ft. 6 in. 4–4–0 engines in use, and they took the places at Glasgow and Carlisle of the old 8 ft. singles, although some of the latter had given place provisionally to the rebuilt "express goods" engines of the 420 class. The new bogie engines were none too soon in their arrival on the scene, for not only had the existing trains become heavier,

* No. 124 broke down on two or three occasions on the 10.0 a.m. Scotch express from Glasgow to Carlisle.



DRUMMOND ENGINE, NO. 123.
Built by Neilson and Co., 1886. Cylinders, 18 in. by 26 in.

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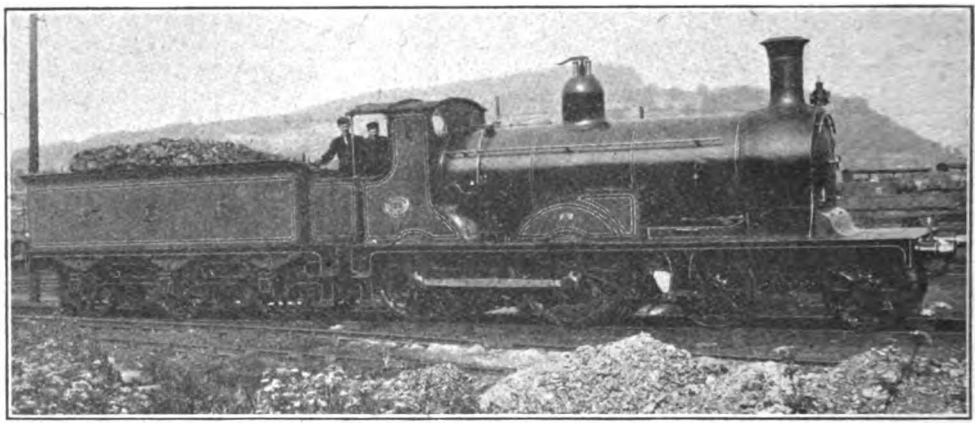

Photo] [*Locomotive Publishing Co., Ltd.*

DRUMMOND ENGINE, NO. 195.

Type of 4-4-0 passenger locomotives for "Coast" trains.
Wheels, 5 ft. 9 in. Cylinders, 18 in. by 26 in.

but a considerable increase in the average speed was beginning to be made. In 1883 Foxwell enumerated only 16 Caledonian trains, with a total daily mileage of 1,156 at a "journey speed," including stops, of 40·2 m.p.h. and a running average of 42¾ m.p.h., exclusive of stops. In the summer of 1888 the daily express mileage had increased to 2,988½ for 46 trains, and the mean journey speed and running average were 41½ and 43·2 m.p.h. respectively. The greater proportion of this express mileage was between Glasgow and Edinburgh and Carlisle, but there now appears an accession to the express work in the form of some excellent through expresses between Carlisle, Perth and Aberdeen, and no less than nine between Perth and Dundee. The Edinburgh and Glasgow express service of 4 trains in 1883 had risen to 12 in 1888, at an average speed of nearly 3 m.p.h. faster, and there were also expresses, one in each direction, between Edinburgh and Greenock. Leaving aside for a moment the special Edinburgh racing express of August, 1888, to be mentioned later, the best train was the 5.15 p.m. from Carlisle (10.30 a.m. from London), which introduced a new feature in the shape of a then new 110 miles non-stop run to Larbert in 2 hrs. 23 min., at an average speed of 46 m.p.h. The same train also ran from Dunblane to Perth, 28 miles in 35 min., a speed of 48 m.p.h.

Until the end of July, 1888, the best train from Carlisle to Edinburgh and Glasgow (the 10.0 a.m. from Euston) left the first-named city at 4.47 p.m., and stopped at Strawfrank Junction, where the Glasgow and Edinburgh portions were divided, both of which reached their final destinations at 7.0 p.m., nine hours being the new time of that day between London and the two Scottish cities. Until June of that year the West Coast companies had been content with a ten-hour service, and as the East Coast nine-hour expresses between King's Cross and Edinburgh were confined to 1st and 2nd class passengers only, the West Coast authorities did not trouble to exert themselves, until the Great Northern, at the end of 1887, suddenly announced that their "exclusive" nine-hour Scotch expresses were from that date going to take 3rd class passengers in addition. On August 1st, 1888, the West Coast cut down the London-Edinburgh time to 8½ hours, the Caledonian share of this being the timing:—Carlisle dep. 4.32 p.m., Edinburgh arr. 6.30 p.m., or 100¾ miles in 118 min. This lasted only four days, because the East Coast had immediately retaliated by cutting the time down to 8 hours, and the West Coast followed suit, and finally on August 13th both the rival routes made a further acceleration to 7¾ hours. The month of August was spent by each of the two rivals in trying to arrive at Edinburgh before the other.

As regards locomotive performance, I think the honours may fairly be said to have been carried off by the Caledonian. Throughout the month of racing only one engine was employed, viz., the celebrated 7 ft. single engine No. 123, and with a load of four bogie coaches maintained for the 100¾-mile run a

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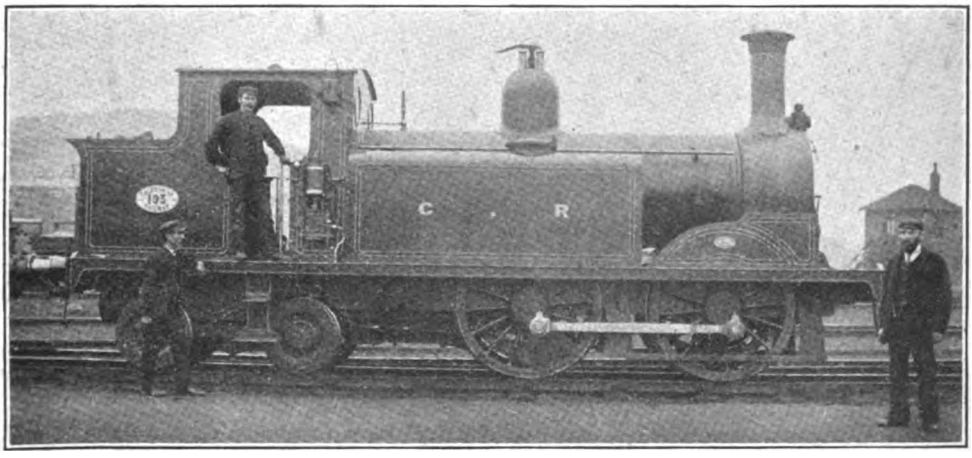
daily average of 107¾ min. Its best performance was on August 9th, when the remarkable time of 102 min. 33 sec. was recorded. The detailed diagram of this run was given in *The Engineer* for March 13th, 1891, from which the following condensed notes have been taken. At the 8th mile-post from the Carlisle start the speed had reached 72 m.p.h., and on the following seven-mile rise of 1 in 200 to the 15th post the speed had fallen only to 54½ m.p.h. It rose again to 72 m.p.h. at the 30th post, not falling below 60 m.p.h. at any point between the 23¼ and the 39½ posts. From posts 40 to 50 up the 10-mile Beattock bank (2 miles 1 in 88, 2 miles 1 in 80 and 6 miles 1 in 75) the time was 14 min. 3 sec., equal to 42·7 m.p.h. throughout, and the last mile was covered at the rate of 36·7 m.p.h. From the 50th post the speed rose again rapidly, reaching 60 m.p.h. at 51½ post, from which point to the 72¾ post the speed never fell below this figure, the maximum being 72 m.p.h. at the 69th post. The usual slack over the Strawfrank loop pulled the pace down to 36 m.p.h., nevertheless, up the following rise 63 m.p.h. was attained. At the Cobbinshaw summit, 82nd post, the speed was 54·5 m.p.h., and finally the maximum for the whole run—73·4 m.p.h. was attained from posts 86 to 87 on the final downhill run of 1 in 100. Posts 84 to 100, 16 miles, were covered in 14 min. 23 sec., or 66·7 m.p.h. The average for the whole 100¾-mile run was 58·94 m.p.h., in spite of the extremely severe adverse gradients. It may be noted that the modern high speeds of 80 m.p.h. and over were not even approached. I have remarked in previous articles that in those days 75 to 76 m.p.h. was the maximum, with one isolated exception, that I myself (and I think I am right in saying Mr. Rous-Marten also) recorded. On this subject and the possible reasons for the higher speeds of to-day I hope to say something in a future article.

Returning now to the 6 ft. 6 in. coupled 4–4–0 engines—60 class—one of them took a train of 150 tons from Carstairs to Carlisle, 73½ miles, in 87 min., of which the last 49¾ miles from Beattock summit took only 53 min., the maximum speed being 74 m.p.h. down the Beattock bank. It was, however, during the 1895 race to Aberdeen and in subsequent years that these engines showed what they could do. Before dealing with this, I should mention that Mr. Drummond resigned in the summer of 1890, and was succeeded by Mr. Hugh Smellie from the Glasgow and South Western Railway. Mr. Smellie never had the opportunity of making his mark on Caledonian locomotive practice, for he died after having occupied the position of chief only a few months.

Mr. John Lambie, who succeeded him, added six more to the class of 6 ft. 6 in. bogie express engines, viz., Nos. 13 to 17, built at St. Rollox in 1894 and usually stationed at Perth and Aberdeen. These engines were in their main features similar to the preceding "Drummonds" with 18 in. by 26 in. cylinders, but the boiler pressure was raised to 160 lbs. The total heating surface was 1,184 sq. ft., towards which the



DRUMMOND 0–4–4 TANK ENGINE, NO. 193.
Built at St. Rollox, 1886–1891. Wheels, 5 ft. Cylinders, 16 in. by 23 in.

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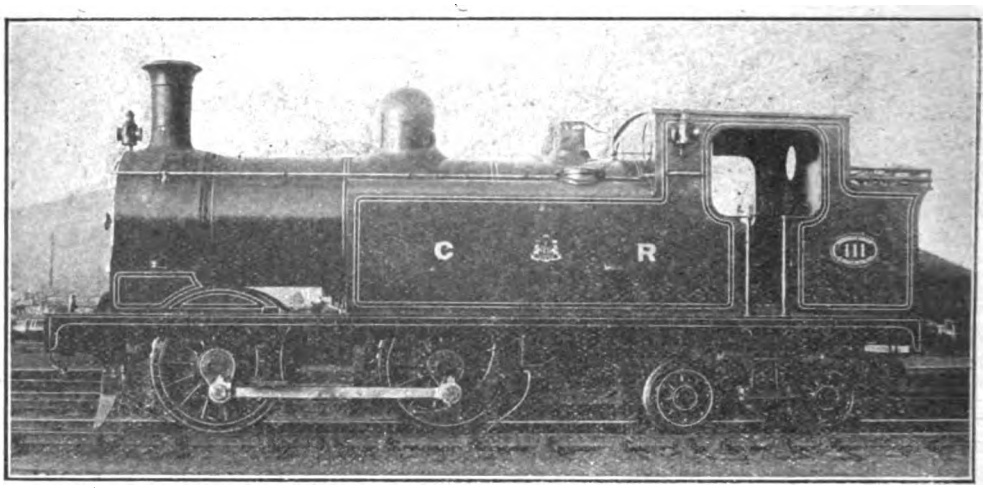

Photo] [*Locomotive Publishing Co., Ltd.*

MCINTOSH 0-4-4 TANK ENGINE, NO. 111.
Series 104–111, 167–170. Built at St. Rollox Works, 1899.
Wheels, 4 ft. 6 in. Cylinders, 17 in. by 24 in.

firebox contributed 112½ sq. ft. In their outward appearance one of the characteristic Drummond features disappeared, in that the Ramsbottom safety valves were placed over the firebox instead of on the dome.

In the summer of 1895 the rivalry between the West and the East Coast, which had been lying dormant since 1888, broke out again more fiercely than ever. This time, however, the night expresses which left London at 8 p.m., and not the day "Scotchmen," were involved, and the race extended to Aberdeen, Edinburgh having on this occasion nothing to do with the matter except indirectly in that the East Coast trains, of course, stop there. Something of the sort had been brewing for some time after the completion of the Forth Bridge had given the East Coast a much more direct route to Perth, Dundee and Aberdeen than had hitherto been the case. Up to July 1st, 1895, the East Coast took 11 hrs. 35 min. to Aberdeen, but the West Coast remained content with a timing of 11 hrs. 50 min. On July 1st the latter knocked 10 min. off their time, so the East Coast promptly proceeded to abolish another quarter of an hour off theirs. In the middle of the month the West Coast suddenly announced that another 40 min. was to be deducted from their timing bringing it down to 11 hours for the 540 miles from London, and on July 22nd the East Coast responded with a schedule of 10 hrs. 45 min., but were forestalled, for on the same day the West Coast started to run its trains in 10 hrs. 35 min. By August 1st they had got to 10 hrs. 25 min. for the East Coast and 10 hrs. 20 min. for the West Coast, and the Aberdonians were rubbing their eyes and wondering if at this rate the granite city was going to become a sort of northern suburb of London. But it was a magnificent time for railway enthusiasts and speed timers, the like of which has never been seen since. The racing goal was the signal-box at Kinnaber Junction, 40 miles from Aberdeen, where the North British trains from Dundee come on to the Caledonian metals, and the train that got past Kinnaber first had, of course, a clear road ahead of its rival.

As regards the locomotive work of the Caledonian, the marked feature was that only the 6 ft. 6 in. coupled engines were used, and the celebrated single, No. 123, the heroine of the 1888 race, did not put in an appearance until the end. But the trains in the later race were much heavier to begin with. Perhaps the most extraordinary thing about the race was that neither company worried about times of arrival and departure at intermediate stations, but went ahead as fast as it was possible to go; consequently the train due to leave Perth at 5.10 a.m. for Aberdeen according to the time-table, departed at 5.1, 9 min. before time. The statistics of the number of unfortunate passengers left behind, who were in fact in plenty of time to catch the trains but

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nevertheless missed them, has never been published. After all, what do passengers matter in such a case, mile-posts are the only things that count!

I give the following records of the race on the Caledonian Railway made by Mr. Rous-Marten and condensed from *The Engineer* of August, 1895, as I think they are of greater interest than examples of the usual runs made in daily average service, since they represent the high-water mark of the 6 ft. 6 in. coupled engines. I have, however, worked out and added the second table of average speeds.

Miles.	Station.	1 Engine 90, Carlisle to Perth. Engine 66, Perth to Aberdeen. 112 tons throughout.		2 Engines 91 and 78, Carlisle to Stirling. Engine 78, Stirling to Perth. Engine 70, Perth to Aberdeen. 195 tons throughout.		3 Engines 78 and 90, Carlisle to Summit. Engine 90, Summit to Perth. Engine 17, Perth to Aberdeen. 207 tons to Perth. 110 tons Perth to Aberdeen.
		H. M. S.	Due.	H. M. S.	Due.	
—	Carlisle .. .. .. dep.	1.59. 1	2.5	1.48. 2	1.52	1.41.35
8½	Gretna .. .. .. pass	—		57.38		45.24
25¾	Lockerbie .. .. .. „	2.27.37		2.15.29		2. 2.12
39¾	Beattock .. .. .. „	40.50		28.28		14.28
49¾	Summit .. .. .. „	56.51		43.58		arr. 29. 2 pilot dep. 32. 6 off.
52½	Elvanfoot .. .. .. „	—		—		35.58
67	Symington .. .. .. „	3.12.56		59.21		48.35
73½	Carstairs .. .. .. „	19.14		3. 5.19		54.54
84	Law Junction .. .. „	30.58		16.49		3. 4.40
109½	Larbert .. .. .. „	4. 0. 1		45. 0		—
117¾	Stirling .. .. .. arr.	4.10.10	4.20	3.53. 1	4. 2	3.42.12
	„ .. .. .. dep.	4.14.52	4.22	57.41	4. 5	46.44
134¾	Crieff Junction .. .. pass	38.27		4.23.29		4. 9.17
150¾	Perth .. .. .. arr.	4.54.20	5. 5	4.38.36	4.44	4.24.19
	„ .. .. .. dep.	5. 1. 9	5.10	4.43.35	4.49	4.29.42
166½	Coupar Angus .. .. pass	19.16		5. 3.43		47.20
177½	Glamis .. .. .. „	29.16		14.45		57.18
183½	Forfar .. .. .. arr.	5.34.59	5.45	5.20.51	5.24	5. 2.53
	„ .. .. .. dep.	5.38. 2	5.47	5.23.12	5.26	5. 5.18
198	Bridge of Dun .. .. pass	—		—		21.40
210	Lawrencekirk .. .. „	6. 8.45		—		33.54
224½	Stonehaven .. .. .. „	24. 5		6. 9.50		49. 3
240½	Aberdeen (ticket platform) arr.	43. 7	7. 0	6.26.57	6.33	6. 5.56
	„ station .. .. „	6.49.40		6.29.55		6. 9.58

Miles.		1		2		3	
		Engine.	Speed. m.p.h.	Engine.	Speed. m.p.h.	Engine.	Speed. m.p.h.
39¾	Carlisle dep. to Beattock pass ..	90	57·04	91 & 78	58·98	78 & 90	62·37
10	Beattock pass to Summit pass ..	„	37·47	„	38·71	„	41·2
—	Minimum speed up 1 in 75 ..	„	34	„	33	„	?
23¾	Summit to Carstairs pass	„	63·65	„	66·75	90	*62·46
44½	Carstairs pass to Stirling arr. ..	„	53·34	„	55·66	„	56·13
117¾	Carlisle dep. to Stirling arr. ..	„	53·88	„	56·55	„	*56·18
33	Stirling dep. to Perth arr.	„	49·73	78	48·4	„	52·7
32½	Perth dep. to Forfar arr.	66	57·64	70	52·33	17	58·77
57½	Forfar dep. to Aberdeen arr. .. (Ticket platform)	„	52·8	„	53·88	„	56·65

* Includes stop at Summit to detach pilot.

No. 1 run includes slight slacks at Carstairs and Larbert, and a severe slack to 15 m.p.h. at Guthrie, 7 miles north of Forfar.

No. 2 run was performed in a strong side wind throughout.

No. 3 run includes slack to 15 m.p.h. at Guthrie.

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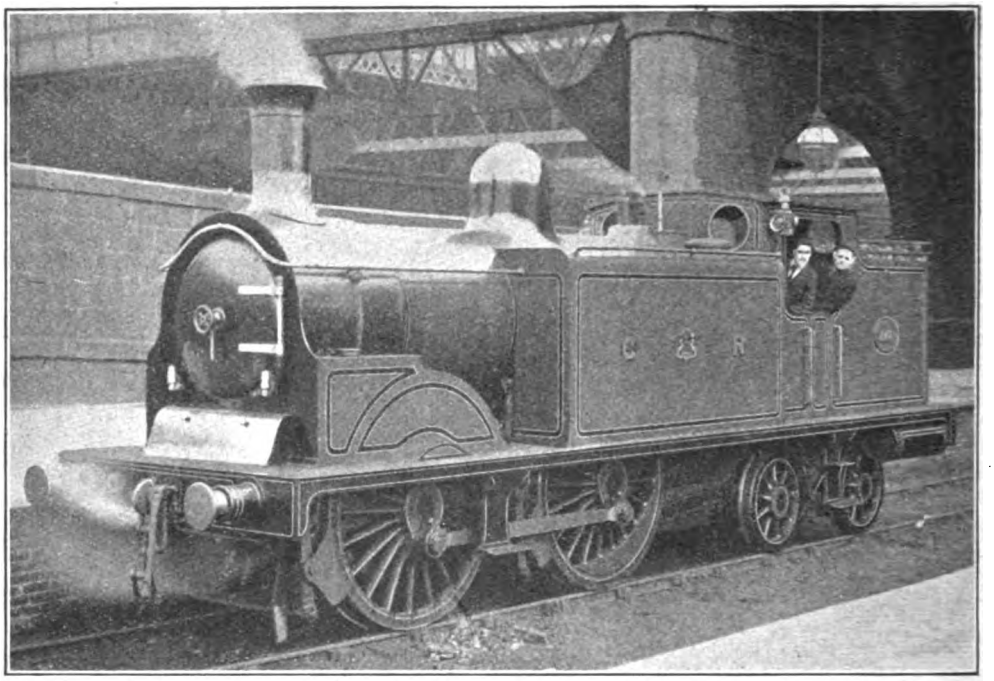

Photo] [*Locomotive Publishing Co., Ltd.*

MCINTOSH STANDARD 0–4–4 BOGIE TANK ENGINE, NO. 440.
Wheels, 5 ft. 9 in. Cylinders, 18 in. by 26 in.

After the above performances with the fairly heavy trains, the competition grew so keen that both of the rival routes jettisoned all superfluous cargo and reduced the loads. On the first of the last three nights of the race with a load of four bogie coaches No. 90 made the run from Carlisle to Stirling, 117¾ miles, in 119½ min., and from Perth to Aberdeen No. 17 covered the stretch of 89¾ miles in 81 min. at the extraordinary speed of 66½ m.p.h. start to stop. This was the run in which the total time from London was 538 min. The following night the West Coast reduced the time to 535 min., but, nevertheless, were beaten by no less than 15 min. by the East Coast. On the final night a successful attempt was made to beat all previous records, and the London to Aberdeen distance of 540 miles was covered in the marvellous time of 512 min.—stops included. On this occasion the load was only 3 bogie coaches throughout. The Caledonian share in the matter was to run 240 miles from Carlisle to Aberdeen, with one stop at Stirling, in 242 min., and the Perth stop was omitted from the schedule. The 122¼-mile run from Stirling to Aberdeen was on this last occasion undertaken by the heroine of the 1888 race, the 7 ft. single No. 123, which was specially requisitioned for the final scene. I may mention that for some time this engine had been running between Aberdeen and Perth and regularly worked the 5.25 p.m. up express from the former city.

Other excellent runs by the four-coupled 6 ft. 6 in. engines were :—

	Miles.	Time. M. S.	Speed.	Coaches.	Engine.
Symington to Carlisle	66¾	72.57	54·9	20	87
,, ,,	66¾	71.30	56·0	17	14
Forfar to Perth	32½	32.59	59·1	17	75
,, ,,	32½	32.41	59·7	13	67
,, ,,	32½	32.24	60·2	10	67

The majority of the earlier Drummond bogie engines Nos. 60 to 75 were subsequently rebuilt in 1900–1902 by Mr. McIntosh with large "Dunalastair" boilers.

The tank engines for local and branch line passenger traffic underwent from 1884 just as drastic a change of design as had taken place in the case of the express engines. Mr. Drummond's contribution to the stud of Caledonian passenger tanks consisted of 24 engines of the 171 class, all of which were built at St. Rollox from 1884 to 1889. They were comparatively small engines with 5 ft. wheels, cylinders only 16 in. by 22 in., and trailing bogies having solid bogie wheel

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centres. The most noteworthy feature of their design was that the position of the bogie was reversed as compared with the standard tank engines built by the same engineer for the North British Railway. The latter had the same dimensions as regards wheels and cylinders, and also solid bogie wheel centres, but were of the 4-4-0 type with the bogie at the leading end. Why Mr. Drummond suddenly reversed his practice when he went from Cowlairs to St. Rollox I do not know, but the fact remains that he immediately adopted the very popular 0-4-4 variety. These little engines had only 672 sq. ft. of heating surface and weighed 37¾ tons in working order. The tank capacity was 830 gallons. They were employed on various branch lines, and one of them stationed at Arbroath worked in turn with one of the North British tank engines on the Dundee and Arbroath joint line.

But Mr. Drummond's North British 4-4-0 type of tank engine, though discarded by himself for Caledonian purposes, seems to have appealed to his successor, Mr. Lambie, who built engines Nos. 1 to 12 of this type at St. Rollox in 1893 with 5 ft. wheels, 17 in. by 24 in. cylinders, 1,096 sq. ft. of heating surface and a tank capacity of 1,000 gallons. These engines were used for a long time on the local services round Glasgow.

The Glasgow Central Railway, most of which is "Underground," may be said to be mainly responsible for the development of these and later Caledonian tank engines. This line leaves the main line between Carstairs and Glasgow at Rutherglen, swings round under the high level Central station and finally emerges on the west side of the city. It serves as a most important connecting link between the south-east and east sides and the large works to the west on the Clyde. Condensing engines are used, of which the original series were the outside cylinder 2-4-2 tank engines 152 to 166. Mr. Lambie's 4-4-0 tank engines Nos. 1 to 12 were built for work over the Glasgow Central Railway, and consequently, fitted with condensing apparatus.

Mr. McIntosh, however, preferred the 0-4-4 type of tank engine, and in 1895 built at St. Rollox the first ten Nos. 19 to 28 of a long series of these engines. This numerous class, which has been standard on the Caledonian for twenty years, has 5 ft. 9 in. coupled wheels and 18 in. by 26 in. cylinders. They are mostly, of course, to be found in the Glasgow area. The 2-4-2 type of tank engine has not "caught on" with the Caledonian; the experience with the old outside cylinder engines of this type—152 to 166—seems to have had a damping effect on the locomotive department. It is, however, worth noting that no Scotch railway has ever used the 2-4-2 type, except in the case of the 15 Caledonian engines previously mentioned, and I am inclined to think that Scotch caution in this respect is justified.

Whilst on the subject of passenger tank engines I may as well complete the account with mention of another class of 0-4-4 side tanks built by Mr. McIntosh at St. Rollox in 1899 of special dimensions for the Glasgow and Cathcart suburban circle trains. The engines are Nos. 104 to 111 and 167 to 170, and have coupled wheels only 4 ft. 6 in. diameter and 17 in. by 24 in. cylinders.

The goods engines were also just as completely altered in type by Mr. Drummond as the other locomotives. The antiquated four wheels coupled engines gave way to the more modern standard six-coupled inside-cylinder type, and the class introduced by Mr. Drummond in 1883 with 5 ft. wheels, 18 in. by 26 in. cylinders and 150 lbs. pressure, has been the progenitor of nearly all the modern Caledonian goods engines. After 1899 Mr. McIntosh enlarged the type by providing much bigger boilers and 18½ in. by 26 in. cylinders (812 class).

An old friend of mind in Scotland has kindly pointed out that on page 157 I mention No. 311 a converted and rebuilt Crampton which had been the property of the Dundee and Arbroath Railway, and has reminded me that this railway did not possess a Crampton engine. My friend is quite correct, and on looking out the available information in my possession I find that there were two Crampton engines belonging to the Scottish North Eastern Railway (Perth to Aberdeen), which were stated to have been built by Messrs. E. B. Wilson and Co., of Leeds, about 1850. These two engines were rebuilt (and possibly converted) in 1861, and it is probable that 311 was one of them, as this engine came from the Scottish North Eastern Railway. There was also an old Crampton engine, the *Kinnaird*, on the Dundee and Perth Railway which, I believe, became No. 461 of the Caledonian Railway. All these engines had 7 ft. wheels and 16 in. by 20 in. cylinders. My friend also writes that the late Mr. McIntosh once mentioned to him that the Scottish North Eastern Railway had one or two Crampton engines.

(To be continued.)

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NORTH BRITISH RAILWAY.

Photo] [*Lafayette, Glasgow.*

MR. JAMES CALDER,

General Manager.

Born on the Railway's property at Blackhall station, near Shotts (where his father was stationmaster), on June 15th, 1869, Mr. Calder was educated at Shotts and Hamilton. He entered North British Railway service as clerk at Peacock Cross station, Hamilton, on April 10th, 1883, where he remained for two years. Thereafter two years were spent at Lennoxtown station, and he removed to Craigendoran station in June, 1887. Transferred from Craigendoran to District Superintendent's Office, Glasgow, under the late Mr. George Cunningham, District Superintendent, in August, 1887, he received an appointment in the General Manager's Office, Edinburgh, on June 2nd, 1892. He was appointed Assistant to General Manager on November 1st, 1903, and Assistant General Manager on January 1st, 1913. On Mr. W. F. Jackson intimating his retiral as from the beginning of April, 1918, the Directors unanimously resolved to appoint Mr. Calder General Manager. The Chairman at Annual General Meeting of the Company, held on February 22nd, remarked :—

"I am glad to say that the Directors have found in Mr. Calder one of the Company's own staff, who they confidently believe will prove a worthy successor to Mr. Jackson."

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Gradients of Our Chief Railways.

SUPPLEMENT: GREAT WESTERN SHORTENED MAIN LINE TO THE WEST.

By W. J. SCOTT, B.A., A.M.S.E.

SINCE the former articles on gradients appeared in this magazine, the West of England main line of the Great Western has been completely changed between Reading and Taunton, by the opening of a new "cut-off" (22½ miles long) from Castle Cary through Somerton into the old Bristol and Exeter main line at a junction-point, now known as Cogload Box, just ¾ mile west of Durston, or 5 miles east of Taunton. The new section is, of course, laid as a first-rate 'main' track, while the old Berks and Hants line, Reading to Patney, and the "Wilts, Somerset and Weymouth," Westbury to Castle Cary, have both been 'doubled' and brought up to the same standard, though the rather stiff grades remain, especially on the latter section. The two are linked up by the Sturt (*i.e.*, Patney and Churton) and Westbury line, first opened as a shortening of the Paddington–Weymouth route. Thus the new route, 20 miles shorter than the old one by Bristol, is made up of five sections, viz., (a) the old main line, as between London and Reading, and again all west of Cogload Junction; (b) the Berks and Hants (Hungerford, Devizes, etc.) branch, Reading to Patney and Churton; (c) the Sturt and Westbury "cut-off"; (d) the old Wilts and Somerset line, Westbury to Castle Cary; and (e) the Somerton "cut-off," Castle Cary to Cogload.* Except on the last-named bit, there is nothing like a "key-gradient," but the grades as a whole are much heavier than those on "Brunel's billiard-table," by Swindon, Bath and Bridgwater; in fact, the shorter line between Paddington and Taunton and Exeter is one of fairly average difficulty, though still not exactly a "hard" road. It is, on the whole, harder for east-bound trains than for west-bound ones, although Paddington station (which lies below the level of its own part of London) stands lower than any points—such as the Athelney marshes, or even the Laira—between London and Plymouth. Up trains have also a slight slack at Cogload Junction which down ones escape—the difference between 'facing' and 'trailing' points.

Roughly speaking, west-bound trains, after the virtual level for 36 miles to Reading, and the three 'service-slacks' in 1½ miles at the latter town, have a long rise of about 30 miles to Savernake, very gentle as far as Newbury, but the last 17 rising 250 ft., at grades which steepen to 1 in 159 and 141 before the end. A fairly long fall follows at once from the Savernake summit to Westbury; 25½ miles in all, but "washing out" to virtual level about a mile west of Lavington, with even a faint rise before Westbury itself. A severe slack through that station, and some 'restrictions' on the curves beyond it, make a bad approach to the sharp undulations on the 5½ miles to Frome (mostly rising, partly at 151); another severe 'slack' for the curve of the latter station leads to the Witham bank, a rise for about 7 miles at varying grades, ending at 107 to the "122¾ mile-post" summit. This climb of about 135 ft. in seven miles is the last 'pull' a down train has to face on the new line; a sharp fall at 81, 98, etc., for the nearly 7 miles to Castle Cary leads to the many undulations, mostly downwards, of the Somerton section, ending in virtual level to Cogload. From the 122¾ Summit to the dead level of Athelney is nearly 27½ miles, in which the total fall is over 300 ft. Of course "Exeter non-stops" have still the severe Wellington-Whiteball bank to face, with parts at 1 in 80, but this is common to the old and the new routes.

For up trains, the slack at Cogload, though nominally only to 50 miles an hour (usually nearer 40 in practice), makes a bad start for the long ascent of about 30 miles, broken by falls at 330 before Athelney and at Keinton, besides one at 264 at Somerton.

* Four miles of this, Curry Rivel Junction–Athelney, is along the old Durston–Yeovil branch, but has been wholly relaid as a double main line track.

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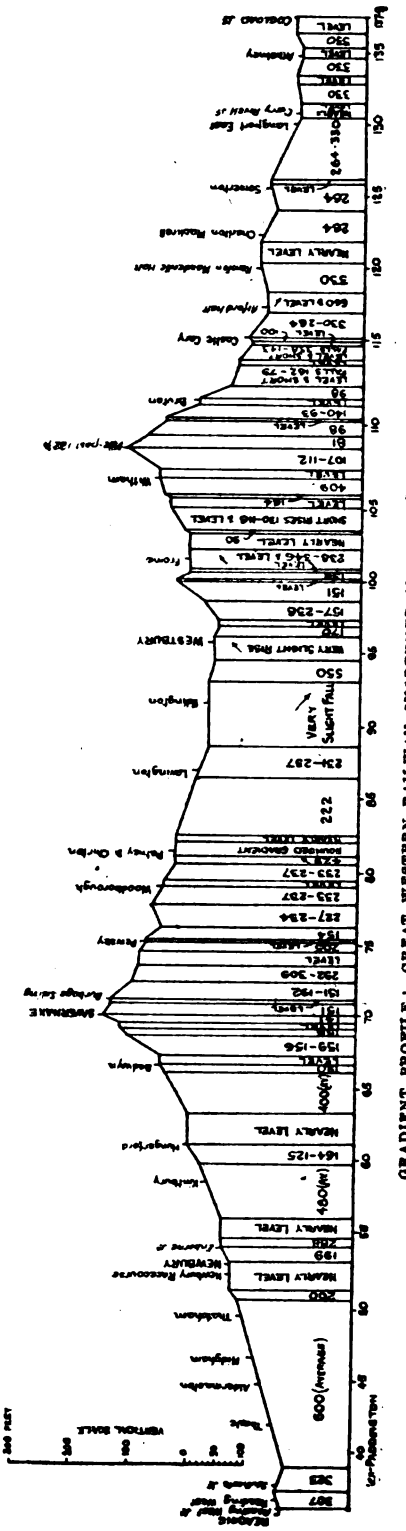
The undulations are easy to Castle Cary, but then the "Bruton bank" rises steeply for over 6¾ miles at 143, etc. (a tiny bit at 79), to Bruton, thence at 93, 98, etc., ending at 81 to the summit. After a good run down the Witham bank, the sharp slack at Frome leads to a short rise at 138, and three further falls to Westbury (the final rise at 170 to that station may be said to be 'absorbed' in the slack). Easy running follows from Westbury to within 1¼ miles of Lavington, but then comes another long rise for nearly 18 miles: at 231 to 222 to Patney, with some level and a definite fall beyond Wadborough, but with upward bits at 154, and 205 around Pewsey. The bank ends in a rise at 192 to 141 in the last two miles to Savernake, which is the last summit an east-bound train has to surmount; the whole rise from before Lavington is over 180 ft. The remaining 70 miles to London are mostly downhill to near Southcote Junction, and all but level for the final 36 miles from Reading (main station), but the run is a good deal spoiled by the threefold speed-reductions in 1½ miles at Reading. With the loads hauled by this route, of at least 300 tons, and often of well over 400, it is doubtful whether the slightest appreciable rising grade can rightly be called "easy."

All the banks of any length, it may be noted, are "A" shaped (with no 'table-land' tops), and not "V" shaped: the only "V" shaped dips are short and unimportant.

[From Paddington to Reading, 36 miles, is mostly a quite imperceptible rise at such nominal grades as 1 in 1,760, 1,320, or (at worst) 1,204; but for about 7½ miles from the 10th mile-post nearly to Dolphin Box, is either faintly downhill or level, also from about the 33½ to the 35th mile-post is nominally downhill at 1 in 1,320.]

On leaving the old Bristol line at Reading West-Main Box, the new route rises at 1 in 307 to and beyond West Reading station (*i.e.*, Oxford Road Junction), and then falls for nearly 1½ miles at 327, to beyond Southcote Junction: there are speed restrictions at all three of the last-named spots, though that at Reading Main Junction has been lessened since the improved kind of junction-switch was put in. Then begins the long rise for all but 32 miles to Savernake. As far as Newbury, this is on the average little harder than the old main line from Didcot to Swindon (say 1 in 660), the whole rise for over 14 miles being only 110 ft.; the grades change continuously, and much is virtually



GRADIENT PROFILE: GREAT WESTERN RAILWAY SHORTENED MAIN LINE TO THE WEST.

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level, though after the 50th mile-post is a rise at 1 in 200. At once after Newbury comes a rise at 199, and another to Hungerford at 164 (for a full mile in each case) with easy or nominal upward grades in between.

After a strip of level at Hungerford station comes the Bedwyn–Savernake bank, for over 8½ miles. After very short rises at 125†, 286, etc., at Hungerford, there is a good deal of level for 2½ miles to near Bedwyn: then the bank rises again at 190 (level round Bedwyn station), 193, 156, etc., ending in ¾ mile from Wolfhall at 1 in 141 to the summit at Savernake station. This summit stands some 463 ft. above "datum," or about 415 above Paddington terminus; it is the highest point on the new route, and only a few feet lower than Whiteball. Though the approach to it is nowhere really steep, the long upward slope seems trying to the engines, and in the last ¾ mile from Wolfhall Junction the pace usually falls off a good deal.

Almost at once (after a tiny level strip for Savernake station) the long fall to beyond Lavington begins, over 18 miles in all, broken by a definite rise for 1½ miles west of Pewsey. To Burbage siding the fall is sharp at 1 in 151 (for ⅔ mile), then a short strip of level, and then the fall goes on at 1 in 264, 192, and easy grades or level, 205 (fall) to Pewsey, and 154 for nearly a mile from that station. Then comes the aforesaid uphill bit at 234, 221, etc., changing at once to 233 downhill to Wadbotough, and 237 beyond that station, 2½ miles downhill in all. The last mile to Patney and Churton is a "rounded gradient"; after Patney is another fall for about 5¾ miles, nearly all at 1 in 222, or after Lavington station at 233. About 1 mile beyond Lavington the downhill 'washes out' into quite nominal grades to Westbury, except that from the 92nd nearly to the 94th mile is a fall at 550; the last 1¼ miles into Westbury is level or faintly uphill.

At Westbury, the old Weymouth line (which runs nearly north and south for the most part) is joined, with a severe slack for the curve entering the station (where drivers usually bring the speed down to little over 20 miles an hour), and a slighter 'restriction' for 25 chains of curve a full half-mile south of the station. This 'restriction' makes the fall at 1 in 170 for nearly a mile after Westbury of little help in regaining speed; from about the 96½ mile is a rise for 3½ miles, largely at 151, to a nameless summit north of Frome, whence a sharp fall at 138 leads to "Mineral Loop Junction," after which is another severe slack for the Frome station curve. In actual working, these 5¾ miles from Westbury to Frome, with speed much reduced at both ends, make a difficult stretch, especially for down trains. The next 7¼ miles are nearly all uphill, though mostly at easy or even nominal grades (except for short bits at 90, 118, etc.), as far as Witham; at the latter station comes the 2-mile bank, beginning at 112 and ending at 107, to the oddly named "122¾ mile-post" summit. The summit is almost 435 ft. above 'datum' (*i.e.*, some 28 ft. lower than Savernake); the rise in a little over 7 miles from Frome is nearly 125 ft. [The mile-post from which the name comes shows the distance by the old way from London *viâ* Thingley Junction and Trowbridge.]

This point, "122¾ mile-post," but only 108½ miles by the new route, is the last bit of serious climbing which west-bound trains have to face to Taunton inclusive; almost at once a long fall extends to Curry Rivel Junction, about 22½ miles, or even to Athelney station, 4 miles further. To Castle Cary, 6¾ miles, is sharply downhill (the Bruton bank), beginning at 1 in 81 for a bare mile, then at 98, 93, etc., to a level mile at Bruton station, then another sharply falling mile at 98, rising to 358 and level to Castle Cary; a good many short level strips make this bank rather easier than the foregoing figures would indicate, but there is a fall (or for up trains a climb) of 230 ft. in the 6 miles 66 chains from the summit. At Castle Cary the new "cut-off" through Somerton begins, with practically no curve on leaving the Weymouth line, and so no 'service-slack'; the 15¾ miles to Curry Rivel undulate, mostly at 1 in 264, downwards on the whole, though with some marked rises at the same grade. Before Keinton-Mandeville are two level bits, and after that halt a rise at 1 in 330 for 1¾ miles; at Somerton is an uphill bit at 264 for a mile, with a level strip before the short tunnel; all the rest is downwards at 264, to about Langport (East)—1 in 330 is the fall at the latter station, and almost level beyond till the Yeovil–Durston branch comes in at Curry Rivel Box. In the four miles thence to Athelney is a rise and fall, both at 330, a level 4/5 mile at Athelney—where

† This short, rather hard rise is really a little *east* of Hungerford station, but seems to form part of the climb to Savernake.

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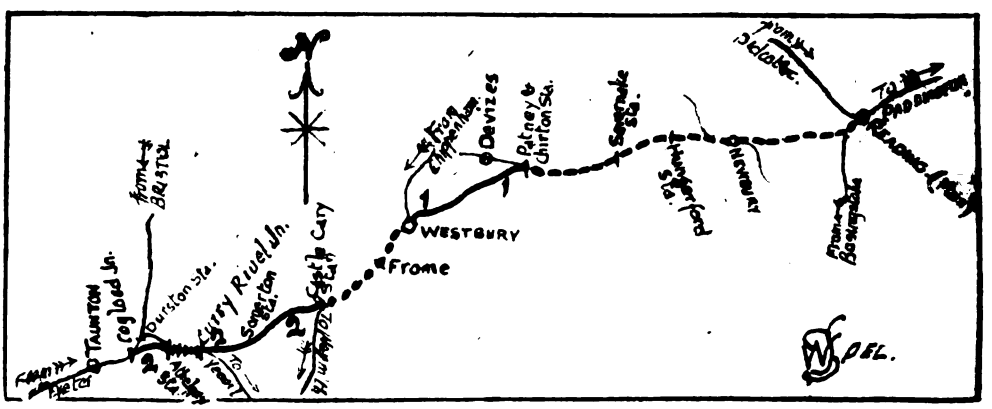
the old branch goes off again (to Durston)—followed by a rising 1¼ miles and then level to Cogload Box, where the Bristol main line is rejoined. It will be seen that the Somerton section of the direct line has a "key-gradient," viz., 1 in 264.

On to Taunton, along the old Bristol and Exeter main line, is almost level until within 1½ miles of that station, when there is a definite rise at 311 and 221.

[West of Taunton to Exeter, the first stopping-point from London for a good many expresses in pre-war days, the grades are shortly as follows:

For 2 miles to Norton Fitzwarren, is a gentle rise, mostly at nominal grades, steepening to 369 and then 209 for the next 2 miles (to beyond Victory siding), then some short easier grades follow, with a steady rise at 174 (Poole siding) and 170 to Wellington. From the latter station, after a little bit of level, the Whiteball bank rises steeply at 90, 86, and 80 (each grade for about ¾ mile), easing to 127 in the tunnel to the small level strip at Whiteball siding itself. This is the highest summit between London and Wrangaton (the latter being summit-level from Paddington to Plymouth). Whiteball Box stands about 468 ft. above "datum" (*i.e.*, perhaps 5 ft. higher than Savernake station); the rise from Wellington is quite 190 ft. in 3¾ miles. The fall to Exeter, a long downhill of all but 20 miles, begins at once; the fall is at 1 in 115 for 2¾ miles, easing to 162, 212, etc., for the next two (these 4½ miles make the Burlescombe bank for up trains), followed by a rise at 1 in 222, etc., to Tiverton Junction and a little beyond that station. Thence to Collumpton is downhill at 1 in 155 for over 2 miles; the remaining 13 miles into Exeter are a gentle fall at varying grades, of which the steepest is a mile at 217 east of Stoke Canon, broken by short rises just after Hele, and mid-way between Silverton and Stoke Canon, with some small level strips: from Cowley Bridge Junction into St. David's station, Exeter, is mostly downhill at 1 in 515.]



GREAT WESTERN RAILWAY SHORTENED WAY TO THE WEST *vid* WESTBURY AND SOMERTON:

1 to 1—Sturt and Westbury.
2 to 2—Castle Cary and Cogload.
(Old) Durston–Yeovil Branch (re-laid section), thus
(Old) Berks and Hants Line, thus
(Old) Wilts and Somerset Line, thus

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.

Photo] [*Chas. S. Lake.*

MIDLAND RAILWAY.

1.35 p.m. down Leeds and Bradford express on Oakley Water Troughs.
4-4-0 3-cylinder compound engine, No. 1024.

SOME rather startling possibilities as regards express train timing in the future are suggested by a letter from a captain in the Royal Flying Corps, who writes: "How soon shall we be reading details of 'British Locomotive Practice and Performance' compiled from the air? I have taken during the last three years quite a number of notes in this way. In the spring of last year I was stationed at an aerodrome adjacent to a very fast 30-mile stretch on one of our main lines, and spent many hours in the air when 'joy-riding' taking notes and timings of the faster trains. The type of locomotive and the load are easily observed, but usually it is impossible to get the number of the engine. The actual timing is both easy and accurate from even 6,000 ft. on a clear day, with the use of an ordinary watch only. On a fast machine I have managed to clock three fast trains in a 10-mile section at once, this being from station to station, of course, and not from mile-post to mile-post." Clocking three trains at once is indeed "some stunt," and puts entirely in the shade, it must be confessed, the modest and prosaic efforts of the average observer from the limited viewpoint afforded by the inside of a compartment. Imagine, for example, the sheer joy of leaving an unenterprising driver to his own devices, and careering back to find another man who was taking a more sporting view of things on the next succeeding express!

"An airman is seldom a railway*ac* or a locomotiv*ac*," the letter continues, "but he must of necessity know something of railways, even if it is only for reconnaissance and other military purposes overseas, but a scout pilot's interest is often confined to racing the trains, or else endeavouring to read the name-board of a wayside station in order to discover his whereabouts! In these days the aeroplane has always the 'legs' of an express train, however strong may be the contrary wind. But I well remember being beaten soundly by several Great Western Railway expresses in the early days of 1915, when I was flying a 70 H.P. Farman 'pusher.' The maximum air speed of this old 'bus' was about 60 m.p.h., whereas the machines I am now flying have over twice that speed! I have never recorded a higher rate than 53 m.p.h. on a French line during 1916 and 1917, when flying in the north of that country and in Flanders." As a postscript the writer remarks: "I suppose it is seldom that a fascinating profession fits in so well with a most interesting hobby, as in this case, but I know of only one other airman-railway*ac* at present." I think I must have made the acquaintance of the latter gentleman the other day. Coming south over a stretch of line which corresponds to the writer's description, we were escorted closely by an airy companion who, while we

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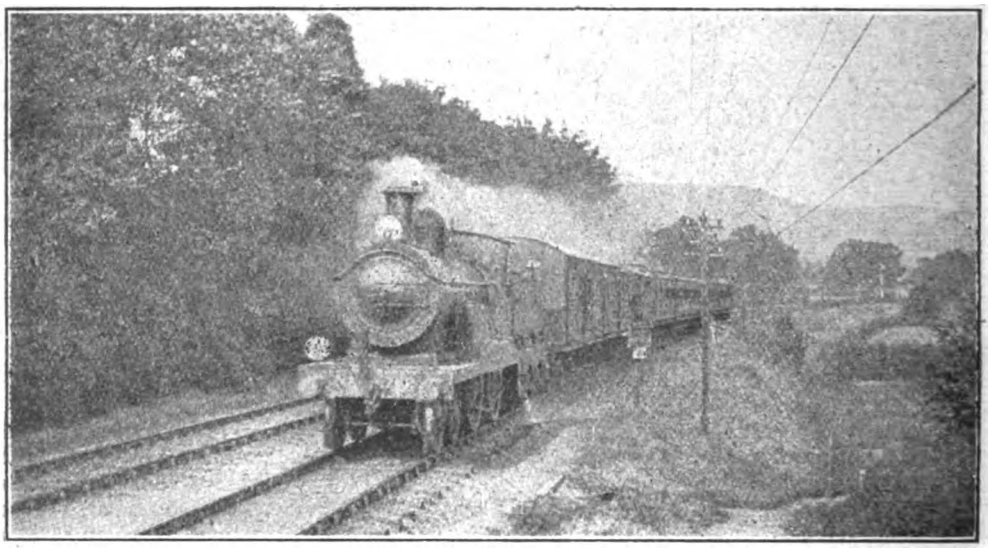
were increasing our speed from 30 m.p.h. to 75 on some 10 miles of falling gradient, nevertheless found time to perform all kinds of astonishing evolutions before finally, with two most courtly bows, nose down almost to the ground and up again, he left us with a wave of the hand and turned homewards. I understood from the train attendant that this particular "turn" is repeated quite frequently.

In the present issue I do not propose to devote any attention to locomotive practice, as I find that I am getting seriously in arrears in the matter of runs awaiting description. I will therefore carry on at once with performance, and in doing so I wish, first, to complete the description of my Manchester–Liverpool experiences by dealing with the runs mentioned in the last issue over the Lancashire and Yorkshire route. This has always been to me the most entertaining journey of the three, as, although the trains on the average have been of lighter formation than those of the competing Cheshire Lines and London and North Western line, the difficulty of the Lancashire and Yorkshire route, with its steep banks and colliery sections and junctions where cautious running is imperative, coupled with the extreme tightness of the standard schedule in relation to the distance—36·4 miles in 40 min.—has called for very hard running. Of the gradients referred to the most pronounced are the 2 miles' rise at 1 in 84 (1·4 miles at this inclination)—118 from Pendleton to Pendlebury, with 0·6-mile continuation at 1 in 340 to Swinton; 1 mile at 1 in 306 and 0·7-mile at 1 in 150 down between Walkden and Atherton, and 0·6-mile up at 1 in 116 from the latter station; 3·2 miles down from Crow Nest Junction continuously at 1 in 93–150; 1½ immediately succeeding miles up at 1 in 150–173 and 2 further at 1 in 91 to Orrell Tunnel; and, lastly, an 8·3 miles' unbroken descent from the latter point to Kirkby troughs, commencing with 2·2 miles at 1 in 111–116, and concluding with 2·8 miles at 1 in 201–291 and a mile at 1 in 360. All these gradients refer to the west-bound direction of running, and, in addition, it is customary for Hindley bank to be taken cautiously by west-bound trains, and for east-bound trains to slack over Pemberton Junction and to run at moderate speed from Swinton into Manchester.



Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Down Reading train drawn by 4–4–0 locomotive (rebuilt with superheater) No. 192, near Betchworth.

Four of my seven most recent runs in the west-bound direction were made on the 2.30 p.m. (now 2.35 p.m.) express *ex*-Victoria—at that time a luncheon car train from Leeds and Bradford whose formation out of Manchester was uniformly one of three corridor 8-wheelers and a 12-wheeled restaurant car, weighing with passengers 135 tons. In each case the engine was an Aspinall inside-

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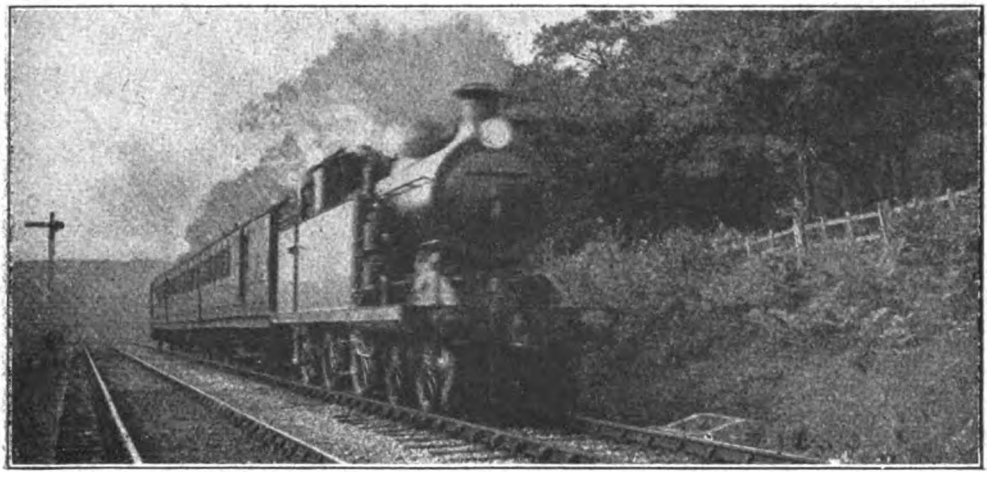
cylinder "Atlantic." On the first journey, behind No. 1397, despite slight signal checks through Salford, we passed Pendleton, 2·3 miles, in 4 min. 20 sec., did not fall below 39 m.p.h. on Pendlebury bank, and were through Walkden, 7·5 miles, in 11 min. 5 sec. Speed rose to 71½ m.p.h. before Atherton and did not fall below 60 at Daisy Hill, while the succeeding length to Pemberton Junction was not taken quite so moderately as usual, as we touched 72½ m.p.h. at the bottom of the descent. So we passed Hindley, 15·2 miles, in 18 min. 20 sec., and Pemberton Junction, 19·1 miles, in 21 min. 55 sec., but a bad permanent way relaying check through Orrell Tunnel caused us to take 28¾ min. to Rainford Junction, 24·4 miles. Down to Kirkby troughs, however, we ran well, main-

Junction, and by reason of the severe check we took 18¼ min. to Hindley and 22 min. 10 sec. to Pemberton Junction, while the same permanent way check as previously at Orrell Tunnel resulted in our time to Rainford Junction being 28¾ min. Immediately afterwards we touched 74 m.p.h., increased to 77½ at Kirkby troughs, and thus passed Kirkby in 33 min., and Kirkdale in 37 min. 5 sec., reaching Liverpool in 40¼ min. Net time on this run was 39¼ min.; from Walkden to Sandhills we took 27 min. precisely, or 26 min. net, and from Rainford Junction to Kirkdale 8 min. 20 sec.

No. 1392 was the engine on the third and fourth occasions, and the initial running was still faster, although there was some falling-off in the subsequent speed on both runs.



Photo] [*P. S. A. Berridge.*

LONDON, BRIGHTON AND SOUTH COAST RAILWAY.

Down train between Dorking and Holmwood, 4–4–2 tank locomotive, No. 33.

taining 75–77½ m.p.h. most of the way, and so breasted Kirkby, 29·5 miles, in 32 min. 50 sec., Kirkdale, 34·1 miles, in 36¾ min., and reached Liverpool, after a slow approach, in 5 sec. under the 40 min. Net time for the 36·4 miles I should put at about 39 min. The 27·4 miles from Walkden to Sandhills were run in 26½ min., or 25¾ min. net, of which distance the 9·7 miles from Rainford Junction to Kirkdale occupied exactly 8 min.

On the second occasion we had No. 1424, and the start was faster than that of the previous run, Pendleton being passed in 4 min. 20 sec., and Walkden in 10 min. 50 sec., with a minimum of 39½ m.p.h. at Pendlebury and a maximum of 71½ before Atherton. But signals were on at Crow Nest

On the third journey we touched 50 m.p.h. after Salford—a smart acceleration in 2 level miles, very sharply curved, even with so light a load as 135 tons—and only fell to 41½ m.p.h. at Pendlebury, so passing Pendleton in 4¼ min., and Walkden in 8 min. exactly. After that we accelerated to 69 m.p.h. before Atherton, fell to 60 at Daisy Hill, and touched 71½ m.p.h. before Pemberton Junction, passing the two latter points in 18 min. 5 sec. and 21 min. 50 sec. respectively. But on this run we had two permanent way checks—at Upholland and at Preston Road—while the highest intermediate speed was only 71½ m.p.h., so the times of 29 min. to Rainford Junction, 33 min. 35 sec. to Kirkby, and 38½ min. to

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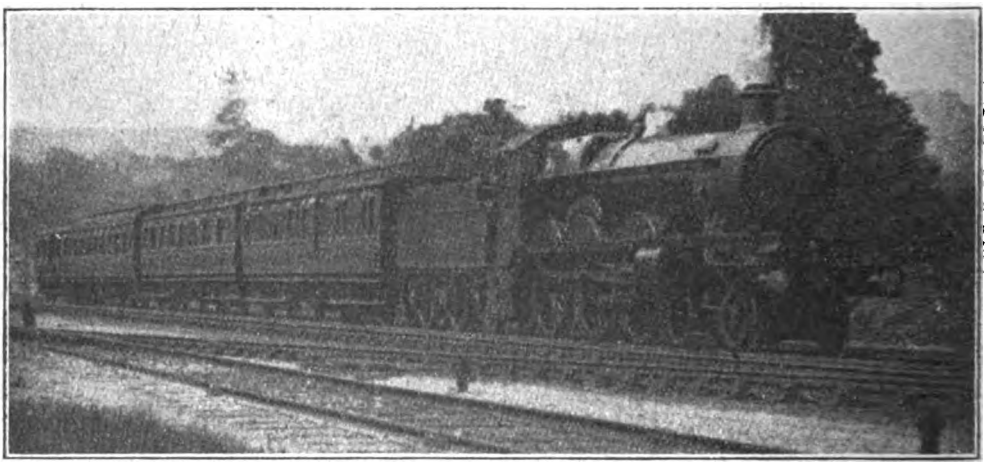
Kirkdale resulted in an arrival 2¼ min. late. I doubt whether net time on this occasion was much, if at all, under 40 min.

Similarly on the fourth run No. 1392 took 5 sec. more out of Manchester, with identical speeds, to all points as far as Walkden, but then touched 72½ m.p.h. before Atherton, and only fell to 64 at Daisy Hill, thereby making the fast times of 17 min. 55 sec. to Hindley and 21½ min. to Pemberton Junction, while Orrell, 20·9 miles, was passed in exactly 24 min., with a minimum rate of 39 m.p.h. at the tunnel. Then came the Upholland check again, together with a very much worse one after Rainford Junction, the latter point being passed in 28¼ min., Kirkby in 33 min. 20 sec., and Kirkdale in 38 min. 40 sec., while Liverpool was reached in 42 min. 5 sec. The highest speed at Kirkby troughs was 69 m.p.h., but with the fast downhill running of the first run, we might have completed the journey unchecked in 38¾ min. As it was, our net time was about 39½ min.

There next came a very fast run on the 6.30 p.m. express *ex*-Manchester, No. 1416 being the engine, with a lighter load of three 8-wheelers only, or 90 tons behind the tender. On this occasion we actually reached 54 m.p.h. in 2 miles from the start, and only fell to 48½ m.p.h. on Pendlebury bank, so achieving times of 3¾ min. out to Pendleton —the fastest I have ever noted—and 9 min. 40 sec. to Walkden. At Walkden troughs we were doing 68 m.p.h., and, after an intervening minimum of 64½ at Walkden station, we sustained 75 m.p.h. before Atherton, and only fell to 67 at Daisy Hill, so getting through Hindley in the very smart time of 16 min. 35 sec. Most of the way from Hindley to Pemberton Junction, which was passed in 20 min. 40 sec., we ran without steam, and, although we suffered a very severe permanent way check at Orrell, we accelerated to 42½ m.p.h. on the 1 in 91 up to the tunnel. So Rainford Junction was passed in 27¼ min., and, with a subsequent sustained maximum of 75-76 m.p.h., we were through Kirkby in 31 min. 35 sec. Easing then pronouncedly, we passed Kirkdale in 35 min. 50 sec., and stopped at Liverpool in exactly 39¼ min. Unchecked, we could without difficulty have made the journey in 37 min.; as it was, our net time was about 38½ min.



Photo] [*Raymond Walker.*

GREAT WESTERN RAILWAY.

An up train passing Box, 4-cylinder 4-6-0 locomotive, No. 4046, *Princess Mary*.

The Walkden–Sandhills time on this run was 27 min. 10 sec., or 26½ min. net.

Against these records a couple of journeys on the present 45-min. schedule provide tame reading. On the 2.30 p.m. *ex*-Manchester, No. 1424, with 120 tons, passed Pendleton in 4 min. 35 sec., Walkden in 11 min. 40 sec., Hindley in 19 min. 35 sec., Pemberton Junction in 23¾ min., and Rainford Junction in 31¼ min., running so sluggishly thence down into Liverpool that we actually dropped ¼-min. on the new schedule, and this despite the fact that the train was a little late. No higher speed than 64 m.p.h. was touched, and down the major portion of the banks we ran without steam. Subsequently No. 718, another "Atlantic," on the 5.30 p.m. train and again with 120

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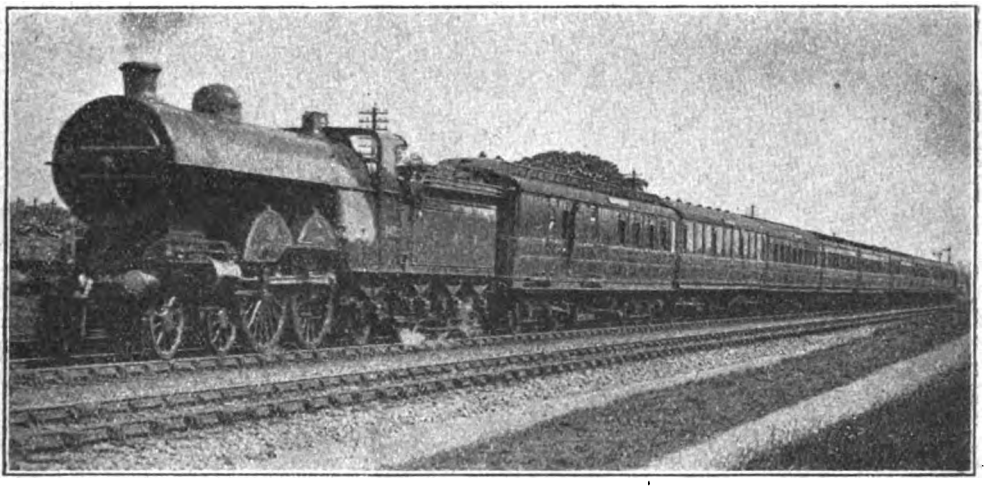
tons, passed Pendleton in 4 min. 35 sec., Walkden in 11 min. 20 sec., Hindley in 19 min. 5 sec., Pemberton Junction in 23¼ min., and Rainford Junction in 30¼ min. Thereafter we ran for so long without steam that speed actually fell to 48 m.p.h.! And this at a point where, only a year or two before, the fire-eating superheater 4-4-0 No. 1098 whirled us along without effort at 85 m.p.h.! The tragedy of this performance was that steam was all the time blowing off furiously to waste from the safety-valves, while we were running 3 min. behind time. In the end we reached Liverpool 44 min. 35 sec. after leaving Manchester.

In the east-bound direction a curious feature of three runs on the 3.40 p.m. but we went very gently down into Manchester, passing Pendleton, 34·1 miles, in 37 min. 10 sec., and reaching Exchange in 40 min. 20 sec. Net time on this run was 39¾ min. On the second occasion, with the lighter load, we got signals "on" immediately after starting, but nevertheless managed to reach 64½ m.p.h. at Kirkby troughs, and had not fallen below 57½ at Rainford Junction; our times were 4½ min. to Kirkdale, 9 min. to Kirkby, 14½ min. to Rainford Junction, and 16 min. 55 sec. to Upholland. Slacking through Orrell Tunnel and over Pemberton Junction, we passed the latter point in 20¾ min.; dropped to 47½ m.p.h. at Hindley, and breasted that station in 25 min. 5 sec.; touched 71½ m.p.h. at



Photo] [*C. Laundy.*

GREAT NORTHERN RAILWAY.

Down Scotch express, hauled by the Royal engine, No. 1442, 4-4-2 type (now superheated).

express was that the engine in each case was No. 1399, the load on the first occasion being 115 tons, and on the other two 90 tons only. On the former run we were doing 50 m.p.h. exactly one mile out of Exchange station, and passed Kirkdale, 2·3 miles, in 3 min. 40 sec.; Kirkby, 6·9 miles, in 8 min. 35 sec. (at 64 m.p.h.); Rainford Junction, 12·0 miles, in 13 min. 50 sec.; and Upholland, 14·4 miles, in 16 min. 20 sec.—an excellent uphill performance. In the tunnel we were checked for permanent way repairs, and so took 20¼ min. to Pemberton Junction, 17·1 miles, and 24½ min. to Hindley, 21·2 miles. At Atherton we touched 72½ m.p.h., and so passed Walkden, 28·9 miles, in 32¼ min.; the minimum rate at Swinton was 64 m.p.h., Atherton and passed Walkden in 33 min.; fell to 65 m.p.h. at Swinton and touched 71½ on Pendlebury bank, passing Pendleton in 37 min. 55 sec., and reaching Manchester in 41 min. 5 sec. Net time on this run was again 39¾ min. On the third run we suffered a particularly long and severe permanent way check at Kirkdale, and another at Atherton, in addition to the usual Orrell Tunnel slack, with the result that the total time was 44¼ min., but the intermediate times, where unchecked, were in close correspondence with those foregoing.

Lastly, I had a run on the 1.40 p.m. train, behind 4-4-2 No. 1405, again hauling 90 tons, which was a smart performance. At Kirkdale we were doing 53 m.p.h., and at

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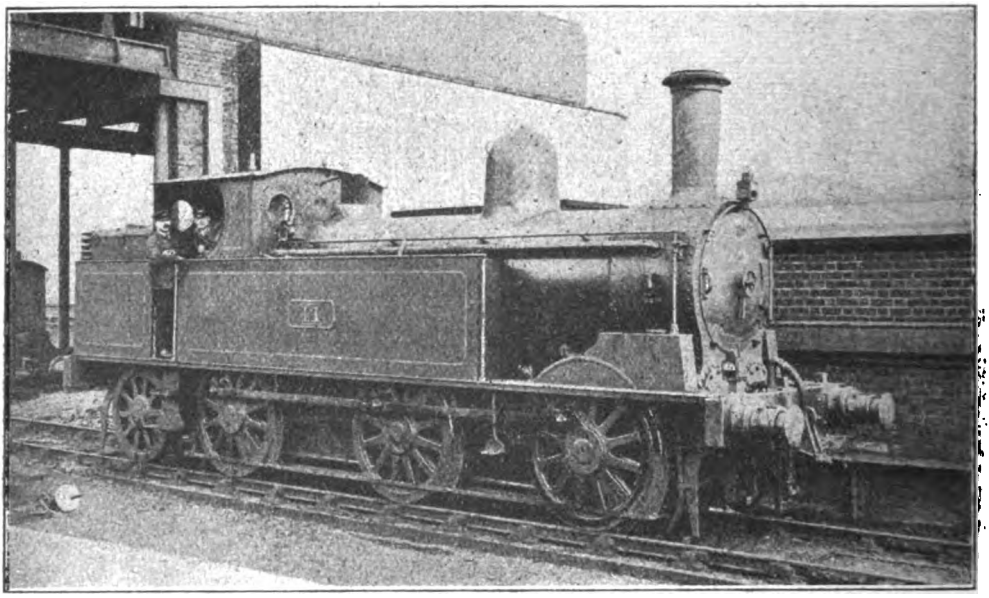
Kirkby troughs 65, while the mile-a-minute rate was maintained as far as Rainford Junction, and we actually had not dropped below 52 m.p.h. on entering Orrell Tunnel, where on this occasion we did not slack. But Nemesis awaited us at the far end in the form of a severe signal check at Orrell station. Our times were 3 min. 20 sec. to Kirkdale, 8 min. 10 sec. to Kirkby, 13 min. 10 sec. to Rainford Junction, 15 min. 25 sec. to Upholland, and 19 min. 10 sec. to Pemberton Junction. Minimum speed at Hindley was 49 m.p.h., and thereafter we touched 70 m.p.h. at Atherton, 69 at Walkden troughs, and minima of 62½ m.p.h. at both Walkden and Swinton stations. The conclusion of the run was, as usual, cautious in character, so that we took 39 min. 50 sec. into Manchester, but this might have been 39¼ min. with a normal descent of Pendlebury bank, or 38¾ min. exclusive of Orrell check. Intermediate times were 23 min. 40 sec. to Hindley, 31 min. 20 sec. to Walkden, and 36 min. 20 sec. to Pendleton. Of timings in this direction on the 45-min. schedule I have none, and cannot confess to any anxiety to secure any, but I trust that the conclusion of the war will at least witness the restoration of this most interesting booking to the time-tables of the Lancashire and Yorkshire Company.

Northern lines have monopolised the "Performance" space in these columns for some months past now, but before coming down to more southerly latitudes I want finally to detail some runs on the well-known racing stretch of the North Eastern main line between Darlington and York. The number of timed runs that I possess over this section is legion, and I must therefore content myself with picking out a few from my last log-book, recorded mainly during 1916, or before the principal reductions of train service came into operation. Only three of the many journeys concerned, which represent the everyday performance of that period, have previously been described here. It will be noticed in these runs that the engines are almost uniformly of the large 3-cylinder 4–4–2 type of class Z, a total number of 50 of which suffices now to work not only all the express trains on the main line, but numbers of fast goods trains also. Including the V class "Atlantics" (mostly now superheated) and the two 4–4–2 compounds, indeed, there are now 72 powerful engines of this wheel arrangement in service.

I will commence with six characteristic runs on the ever-popular 1.9 p.m. from Darlington to York, booked to cover the 44·2 miles from the north end of the former station to the south end of the latter in 43



Photo] [*P. F. Cooke.*

LONDON AND NORTH WESTERN RAILWAY.

0-6-2 tank engine, No. 11, at London Road, Manchester.

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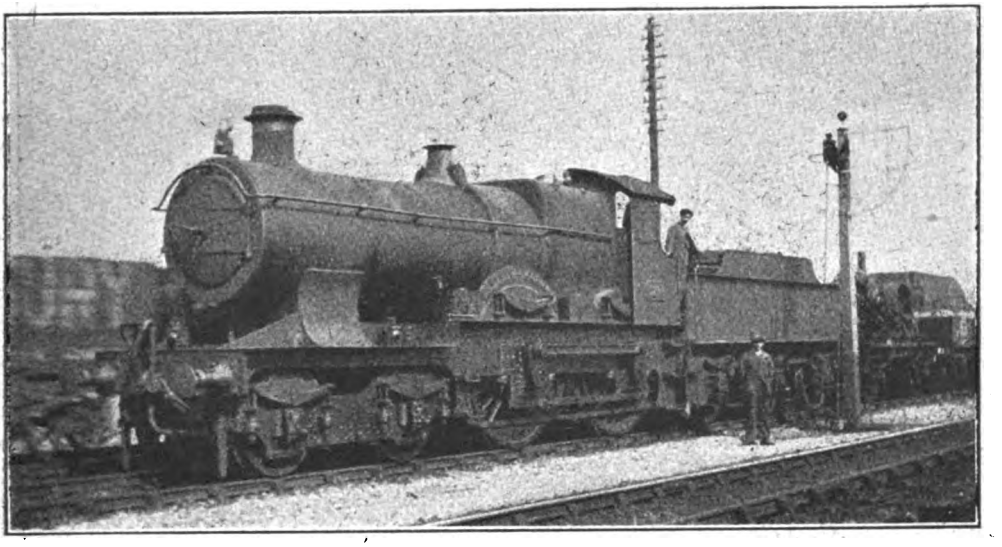
min., start-to-stop. In order of load, the first two were behind No. 2203, hauling six non-corridor 8-wheelers, 146 tons tare and 160 tons full, for the complement of passengers was, as usual, very heavy. We passed Croft Spa, 2·6 miles, in 4½ min.; Eryholme, 5·2 miles, in 7 min. 10 sec.; Danby Wiske, 10·4 miles, in 12 min.; Northallerton, 14·1 miles, in 15¼ min.; Thirsk, 21·9 miles, in 21¾ min.; Pilmoor, 28 miles, in 26 min. 50 sec.; Alne, 32·9 miles, in 30 min. 50 sec.; Beningbrough, 38·6 miles, in 35½ min.; and Poppleton Junction, 42·5 miles, in 38¾ min.; York was reached in 41 min. 40 sec., after a very slow run in. Maximum speeds were 70½ m.p.h. at Danby, 75 at Thirsk, and 76½ at Alne, the minima Skelton Bridge; maxima at Thirsk and Alne were 75 and 72½ m.p.h. respectively. However, we completed the journey in 42 min. 20 sec., passing Danby in 11 min. 50 sec.; Northallerton in 15 min. 20 sec.; Thirsk in 21 min. 55 sec.; Pilmoor in 27 min. 10 sec.; Alne in 31 min. 20 sec.; Beningbrough in 36¼ min.; and Poppleton Junction in 39 min. 35 sec. Cowton to Poppleton Junction took 30 min. 55 sec., and Otterington to Skelton Bridge 20 min. exactly.

No. 2203 on the third occasion had an extra six-wheeler, making up the gross load to 175 tons, and made a normal run, passing Croft in 4 min. 35 sec.; Eryholme in 7 min. 25 sec.; Danby in 12 min. 10 sec.; Northallerton in 15½ min.; Thirsk in 22 min.;



Photo] [*A. B. MacLeod.*

GREAT WESTERN RAILWAY.

6 ft. 8½ in. 4–4–0 locomotive, No. 3715, *City of Hereford.*

being 67 at Northallerton and 71½ at Sessay. The 35·6 miles from Cowton to Poppleton Junction were covered in 29 min. 55 sec., of which the 23·5 miles from Otterington to Skelton Bridge occupied only 19 min. 10 sec., at an average speed of 73·6 m.p.h.

On the next occasion we started more briskly, accelerating from the start to 60 m.p.h. over 2½ miles of level track, and only falling to 58½ up the 2½ miles of 1 in 356–377 to Eryholme, so we passed Croft in 4 min. 25 sec., and Eryholme in 7 min. But thereafter the running was somewhat patchy, as we only touched 65 m.p.h. at Danby, fell to 67 at Sessay and 69 at Tollerton, subsequently accelerating to 71½ m.p.h. at Pilmoor in 27 min. 10 sec.; Alne in 31¼ min.; Beningbrough in 36 min. 10 sec.; and Poppleton Junction in 39 min. 35 sec.; York was reached in 42¼ min. Maximum speeds were 70½ m.p.h. at Danby, 75 at Thirsk and 72½ at Alne, with minima of 57. m.p.h. at Eryholme, 69 at Northallerton and 70½ at Sessay. The Cowton–Poppleton Junction length occupied 30 min. 25 sec., and the Otterington–Skelton Bridge section 19 min. 55 sec. On the fourth run No. 2203 was again in charge, with a further increased load of 185 tons, and on this occasion we were dead stopped by signal at Poppleton Junction, having covered this 42·5 miles' length in 41¼ min. Croft was passed in 4½

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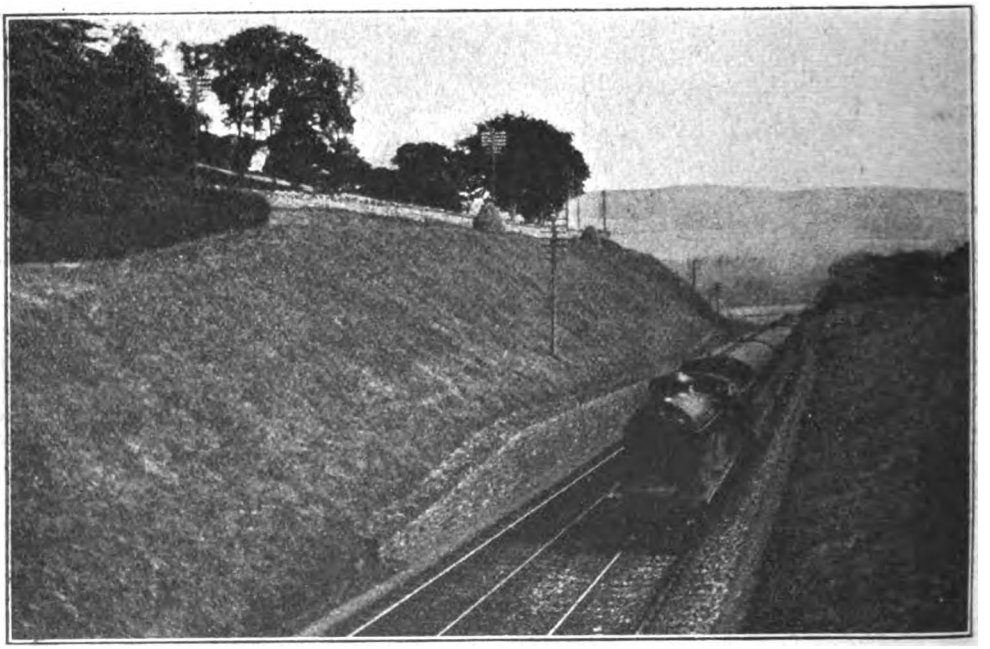
min.; Eryholme in 7 min. 20 sec.; Danby in 12½ min.; Northallerton in 15 min. 50 sec. (some time was lost here owing to a pronounced slack over Wiske Moor troughs); Thirsk in 22½ min.; Pilmoor in 27 min. 50 sec.; Alne in 31 min. 50 sec.; and Beningbrough in 36¾ min. Speeds were more moderate on this run, not exceeding 67 m.p.h. at Danby, and 74 at Thirsk and Alne; unchecked we should have reached York in 42¾ or 43 min.

Two other runs were recorded with heavier loads. No. 2200, with 31 axles, or 200 tons, passed Eryholme in 7¼ min., but was slacked for permanent way repairs near check near Danby; but the net journey time was 42¾ min. We passed Eryholme in 7½ min., and Northallerton in 18 min., but from there recovered well, breasting Thirsk in 24 min. 50 sec.: Pilmoor in 30 min.; Alne in 34 min. 5 sec.; Beningbrough in 38 min. 55 sec.; and Poppleton Junction in 42¼ min. Maxima were 72½ m.p.h. at Thirsk and 75 at Alne, and we ran from Otterington to Skelton Bridge in 19 min. 55 sec. Seeing that the track throughout from Eryholme is only in the faintest degree easier than level, this constant succession of 75 m.p.h. maxima, even with light loads, is worthy of note.



Photo] [*W. F. Anderson.*

NORTH BRITISH RAILWAY.

Slow train from Hawick to Edinburgh nearing Bowland station.

Danby, and so took 16¾ min. to Northallerton. After that, however, with top speeds of 72½ m.p.h. at Thirsk and 75 at Alne, we passed the former station in 23½ min.; Pilmoor in 28 min. 35 sec.; Alne in 32 min. 35 sec.; Beningbrough in 37 min. 20 sec.; and Poppleton Junction in 40 min. 40 sec. Thus we reached York in 43½ min., or 42½ min. net, the Otterington–Skelton Bridge length having been run in 19½ min. exactly. Lastly, No. 2197 had a load of 34 axles, or 215 tons, and took precisely 45 min. on the journey, in virtue of a long and severe permanent way

As against these lightly-loaded trips, three journeys on the 5.56 p.m. up "Scotsman," allowed 48 min. for the run, may be noted briefly. No. 714 was the engine on the first occasion, hauling 52 axles, or 375 tons full, while on the second and third runs Nos. 737 and 716 respectively had each 335 tons behind the tender. The times to Eryholme were 8¼, 8 and 8¼ min.; to Northallerton 18 min. 20 sec. (a permanent way relaying check was experienced at Danby on this run), 17 min. 5 sec. and 17 min.; to Thirsk 25 min. 55 sec., 24 min. 20 sec. and 24 min.; to Alne 36

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min. 20 sec., 34½ min. and 34 min. 10 sec.; and to Skelton Bridge, 41 miles, 43 min. 55 sec., 42 min. and 41 min. 55 sec., the running on the last trip having been eased after Tollerton. Concluding, signal checks were experienced on the second and third journeys, the total times to York being 48 min., 46 min. 40 sec. and 47¼ min. Net times were 46½, 46 and 46 min. respectively; running times from Otterington to Skelton Bridge were 22 min., 21 min. 35 sec. and 21¾ min., with maxima of 64½, 67 and 70½ m.p.h. at Thirsk, and 66, 68 and 69 m.p.h. at Alne—quite smart running with substantial trains.

For really heavy loads, however, one needs to come to present war-time conditions. I have already described in these columns a journey on the 2.6 p.m. up "Scotsman" from Darlington to York with fourteen 8-wheelers and one 12-wheeler—441 tons tare and fully 475 tons loaded—when we passed Eryholme in 9½ min., Northallerton in 20 min., Thirsk in 27 min., at 64½ m.p.h., Alne in 37 min. 20 sec., at 66 m.p.h., and Skelton Bridge in 44 min. 55 sec., thereby reaching York in 49¼ min., and gaining 6¾ min. on the present schedule time. Recently on the 8.48 a.m. (7.50 a.m. *ex*-Newcastle), which is booked to stop at Northallerton in the almost impossible time—with present loads—of 17 min., and to cover the 30 miles thence to York in 34 min., we had No. 2195 and fourteen 8-wheelers, 388 tons empty and 410 tons full. Eryholme was passed in 8¾ min., and Danby in 14 min. 5 sec., at 66 m.p.h., Northallerton being reached in 18¼ min., which with this load was smart work. No. 2196, a week later, with no less than sixteen 8-wheelers, 442 tons empty and at least 475 tons full (the train was crammed), also took 8¾ min. to Eryholme, but 19 min. exactly to Northallerton. From Northallerton the times on the two occasions were 10 min. 35 sec. and 11 min. 5 sec. to Thirsk, 7·8 miles; 21 min. 20 sec. and 22 min. 10 sec. to Alne, 18·8 miles; 27 min. 20 sec. and 27 min. 35 sec. to Beningbrough, 24·5 miles; and 34 min. 20 sec. and 34 min. 10 sec. into York. No. 2195 thus made the quicker start, but, after both engines had touched 64½ m.p.h. at Alne, No. 2196 maintained a higher speed subsequently, and so caught up and overtook 2195's times.

And now for some north-bound runs. Principal among these are five on the late 2.5 p.m. *ex*-York, which of recent years had its booking to Darlington cut from 49 to 45 min., and, as it was at times a fairly heavy train, had some consequent difficulty in keeping time against the gradually rising tendency of the road. Indeed, on none of my runs was time quite kept, although adverse signals or other delays accounted for the loss on certain occasions. No. 2166 (class Z), with 37 axles, or 265 tons, passed Beningbrough, 5·5 miles, in 8 min. 10 sec., and Alne, 11·2 miles, in 13¼ min., having then attained 67 m.p.h. But a bad permanent way relaying check followed, and so we took 19½ min. to Pilmoor, 16·1 miles, and 25 min. 20 sec. to Thirsk, 22·2 miles. Here we had accelerated to 70½ m.p.h.—a rate which only fell to 67 m.p.h. on the 6¾ miles at 1 in 626 to Northallerton, and increased to 72½ beyond Danby; so the former station, 30 miles, was breasted in 32 min. 10 sec., and the latter, 33·7 miles, in 35 min. 25 sec. Again, however, we were checked for permanent way repairs—at Cowton and Croft Junction—and our total time to Darlington was therefore 46 min. 55 sec. But the net time for the 44·1 miles' journey did not exceed 43 min. at most—a remarkable feat in this direction of running with quite a substantial load.

No. 728 of the same class, with 35 axles or 220 tons only, was much more prosaic in achievement, taking 8 min. 25 sec. to Beningbrough, 13 min. 55 sec. to Alne, 18 min. 35 sec. to Pilmoor, 24 min. 20 sec. to Thirsk, 31½ min. to Northallerton, 35 min. to Danby, 39 min. 50 sec. to Eryholme, 38·9 miles, 42 min. 10 sec. to Croft, 41·5 miles, and 45½ min. to Darlington. Maximum speeds were 64½ m.p.h. at Alne, 66 at Thirsk, 68 at Danby, and 71½ at Croft, while the minima were 61½ at Sessay, 64½ at Otterington and 62½ at Eryholme. No. 704, of the second batch of V class 2-cylinder "Atlantics," now superheated, did better with a 280-ton load of 38 axles. We were through Beningbrough in 8½ min., Alne in 14 min., Pilmoor in 18½ min., Thirsk in 24 min. 10 sec., Northallerton in 31 min. 20 sec., Danby in 34 min. 50 sec., Eryholme in 39¾ min., and Croft in 42 min. 5 sec., Darlington being reached in 5 sec. over the allotted ¾-hour. On this run maxima were reached of 66 m.p.h. at Alne, 67 at Thirsk, 68 at Danby and 71½ at Croft, the intervening minima being 64½ at Sessay, 64 at Northallerton and 64½ at Eryholme—altogether a very uniform effort, against a hampering south-west wind.

With heavier loads time was not kept. No. 729, a Z class 4–4–2, had to haul a 305-ton load of 44 axles, and took 9 min. to Beningbrough, 14 min. 40 sec. to Alne, 25 min. 20 sec. to Thirsk, 33 min. 5 sec. to Northallerton,

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41 min. 50 sec. to Eryholme, and 47 min. 35 sec. to Darlington—a loss of over 2½ min. From Tollerton to Northallerton speed varied from 59 to 64½ m.p.h.; 65 m.p.h. was touched at Danby and 66 at Croft, with an intervening minimum of 59 at Eryholme. The biggest load I have seen on this train was one of 48 axles, including ten vestibuled 8-wheelers and weighing in all 340 tons; No. 2170 was the engine on this occasion. A very slow start was made, 9½ min. being consumed to Beningbrough, 15 min. 20 sec. to Alne, and 20 min. 10 sec. to Pilmoor, with no higher speed than 62½ m.p.h.; as we were approaching Thirsk at 64 m.p.h., however, we were checked by signal, and so took 26 min. 20 sec. to that town, and 34 min. 20 sec. to Northallerton. There was now a fine recovery, speed rising to 69 m.p.h., sustained, beyond Danby, not falling below 64 at Eryholme, and rising again to 72½ m.p.h. at Croft, so that Danby was passed in 37¾ min., Eryholme in 42½ min., Croft in 34 min. 50 sec., and Darlington was reached in 48 min. exactly. Net time was about 47¼ min.

On the 9.34 p.m. *ex*-York, which is still scheduled to complete the journey in 45 min. and thereby retains the fastest booking in the country, No. 717, with 39 axles, or 290 tons, passed Beningbrough in 8 min. 35 sec., Alne in 14 min. 10 sec., Pilmoor in 18 min. 40 sec., Thirsk in 24¼ min., Northallerton in 31 min. 20 sec., Danby in 34¾ min., Eryholme in 39½ min., Croft in 41¾ min., and reached Darlington in 5 sec. under time. From Alne to Sessay speed varied from 64½ to 66 m.p.h., thereafter increasing to 69 at Thirsk, with subsequent maxima of 68 at Danby and 72½ at Croft, and falling to 64½ m.p.h. at both Northallerton and Eryholme. No. 716, with 36 axles, or 270 tons, started more smartly, passing Beningbrough in 8½ min., Alne in 13 min. 50 sec., Pilmoor in 18¼ min., Thirsk in 23 min. 55 sec., and Otterington, 26·6 miles, in 28 min., but was then so badly checked by signals and permanent way cautions as to take all but 50 min. to Darlington; without these slacks we should probably have kept time. Finally, No. 703, 2-cylinder superheated "Atlantic" of class V., second batch, had a much heavier load of 44 axles, or 325 tons, and did excellently despite a dead stand for signals between Thirsk and Otterington. On this occasion we passed Beningbrough in 8 min. 50 sec., Alne in 14 min. 20 sec., Pilmoor in 18 min. 55 sec., and Thirsk in 24 min. 25 sec., immediately afterwards stopping at about the 23½ mile-post from York in 26 min. 10 sec. from the start. On this initial length speed had varied from 64 to 66 m.p.h. between Tollerton and Sessay, but had risen to a sustained 69 just before we stopped. We stood for 25 sec., and then passed Northallerton, 6·5 miles, in 8 min. 50 sec., Danby, 10·2 miles, in 12 min. 55 sec., Eryholme, 15·4 miles, in 17¾ min., and Croft, 18 miles, in 20 min. 5 sec., reaching Darlington, 20·6 miles, in 23 min. 10 sec. Over this section the maximum speeds were 67 m.p.h. at Danby and 70½ at Croft, with an intervening minimum of 61½ at Eryholme. This was quite one of the best trips of the whole series, and there is no doubt that we should have kept time but for the vexatious check experienced *en route*.

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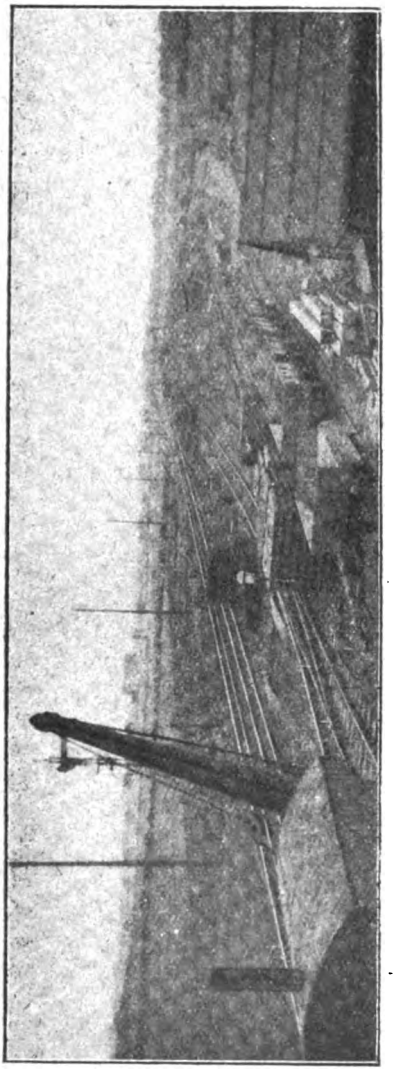
A New Gravitation Shunting Yard. London and South Western Railway.

TO relieve the congested condition of Nine Elms Yard, and facilitate the exchange of goods traffic with other railways, the London and South Western Railway is providing a Gravitation Shunting Yard between Feltham Junction and Feltham station on the down line side of the railway. The site covers an area of 79 acres, and is over one mile in length.

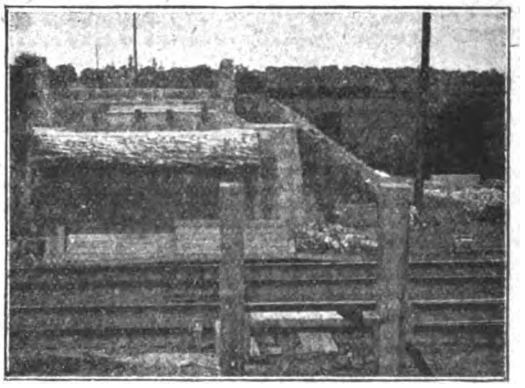
When completed it will be one of the most up-to-date yards in Great Britain. It will deal with all goods traffic arriving from the North and the Midlands for the London and South Western system, also traffic arriving from the West over the South Western Railway for the North and Midlands.



ON LEFT.—UP AND DOWN WINDSOR LINES. CENTRE.—FIRST SIDINGS IN USE. RIGHT HAND.—LAND FOR EXTENSION.

PREPARING FOR DIVERSION OF RIVER CRANE AND MILL STREAM.

The work entails the excavation and forming into embankments of 224,000 cubic yards of earthwork, also the reconstruction of Quaker Road Bridge to a square span of 70 ft., the diversion of the River Crane for a quarter of a mile (the diversion being bridged over for 240 yards), and the bridging of the Mill Stream to the extent of 200 yards. The Metropolitan Water Board's 52 in. water mains cross under the centre of the yard. These will be accommodated in a culvert 240 yards long by 12 ft. span. About 27 miles of single line will be laid out in sidings.



RECONSTRUCTION OF QUAKER ROAD BRIDGE OVER UP AND DOWN WINDSOR LINES.

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Up-reception sidings at the western end of the yard comprise eight sidings, each siding holding about 60 wagons. These will be connected with sixteen gravitation or marshalling sidings, each siding holding 60 wagons and engine. The down-reception and gravitation or marshalling sidings will be practically a repetition of the up-reception sidings. There will be a transfer shed for goods (capable of loading 50 wagons at a time) fitted with overhead cranes.

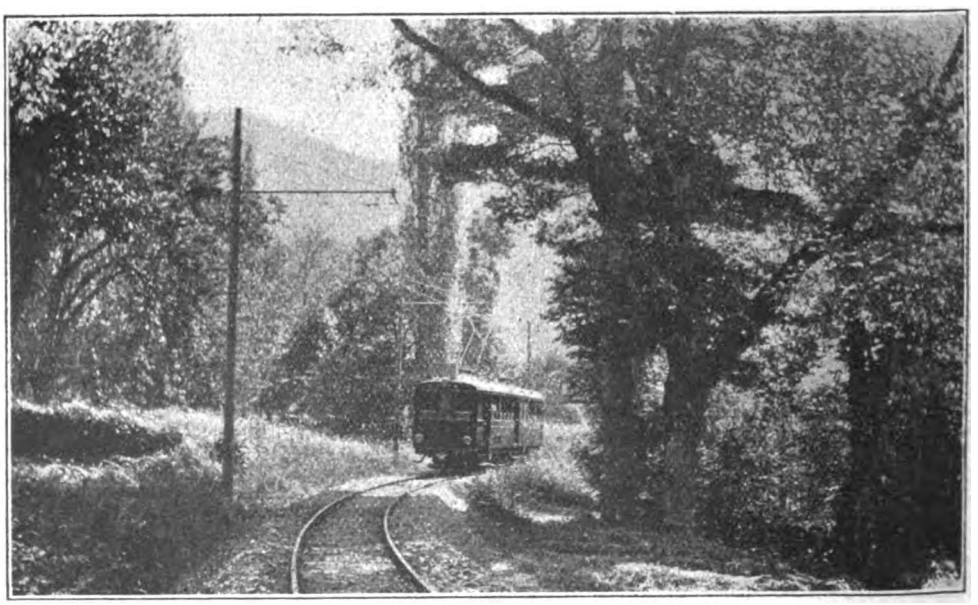
The engine shed is designed to accommodate 36 tender engines (room being provided for a future extension to hold 18 more) with coaling plant for engines. The full trucks of coal will be run on to a cradle, an electric crane will then pick up the cradle and truck from the "fulls" road and empty the coal into a bunker capable of holding 200 tons, afterwards depositing the empty truck and cradle on to the "empties" road. From the bunker the coal will pass into an automatic weighing machine, then into the tender. By this arrangement it is estimated it will take about five minutes to load a tender holding five tons.

Provision is made for stacking about 12,000 tons of coal with the necessary siding facilities—also an elevated water tank to hold 80,000 gallons.

In a yard dealing with such a large amount of traffic a certain number of crippled wagons will have to be dealt with. For this purpose a wagon-repairing shop will be provided, where 40 wagons can be repaired at the same time, together with "cripples" roads holding about 70 wagons. There will also be cattle pens with the necessary washing-out roads.

Cottages and a recreation room for the men will probably be included. The cottages will be designed in various sizes to suit the requirements of the occupants. A canteen with sleeping and washing accommodation may also be provided for the engine drivers, firemen and guards who arrive late at night or in the early morning.

A SWISS RAILWAY SCENE.



Photo] [*R. A. Gurney-Smith.*

C. DE FER ELECTRIQUE VEVEYSANS.
Train approaching Chateau de Blonay station.

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FURNESS RAILWAY.

Photo] [*Whitlock.*

MR. LIONEL SPEAKMAN,

General Manager.

Mr. Lionel Speakman, who has been Outdoor Goods Manager (Northern Division) of the London and North Western Railway since May, 1914, has been appointed General Manager of the Furness Railway in succession to Mr. Alfred Aslett, whose retirement was recorded in the April RAILWAY MAGAZINE. Mr. Speakman is the youngest son of the late Mr. Thomas Speakman, of Stanthorne Hill, Middlewich, Cheshire, and was educated at Cheltenham College. He entered the service of the London and North Western Railway in 1896, and served in London, Liverpool and Manchester. In 1902 appointed assistant District Goods Manager at Liverpool; this position he retained until 1911, when he became District Goods Manager at Wolverhampton until the close of 1913. At the beginning of 1914 he was transferred, in the same capacity, to Birmingham, and in May of that year was appointed to the position at Liverpool, which he has now vacated in order to become Chief Executive Officer of the Furness Railway.

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Two Notable Railway Brothers.

MR. W. FAIRLAMB, Secretary of the Rhymney Railway, and Mr. Thomas Farrance, the Accountant, both retired on pension from the company's service at the end of March.

Mr. J. Gowan Clark, who has been Chief Assistant in the Secretary's and Accountant's departments, has been appointed Secretary and Accountant as from April 1st. Mr. Clark's whole working life has been spent in the service of the company, which he entered in June, 1879. Mr. Clark comes of a railway family. His father was the agent for the London and North Western Railway for many years at Cardiff, and his brother, Lieut.-Colonel Gowan Cresswell Clark, is one of the Assistant General Managers of the Union of South Africa Railways. The new Secretary and Accountant of the Rhymney Railway passed a short period in the audit office before being transferred, in September, 1880, to the Secretary's and Accountant's department, where he remained, having been Chief Clerk for nearly 30 years.

Mr. Gowan Cresswell Strange Clark, C.M.G., one of the Assistant General Managers of the South African Railways, has been appointed an Officer of the Most Excellent Order of the British Empire. Mr. Clark is, as stated in the previous paragraph, brother to Mr. J. Gowan Clark, who has just succeeded to the Secretaryship of the Rhymney Railway. Mr. Cresswell Clark has had a long and varied experience in South Africa, both as a railway and volunteer officer, having been Commanding Officer of the Prince Alfred's Guards, from which position he retired in 1902 with the rank of Lieut.-Colonel and the Volunteer Decoration. Mr. Clark, after serving on the Rhymney, Sirhowy, and London and North Western Railways, became Acting Assistant Manager at Cape Town in 1879. He served in the Basuto war of 1881, was appointed Assistant Traffic Manager, Midland system, in the following year, and Traffic Manager in 1890. In 1902 Mr. Clark was created a Commander of St. Michael and St. George, and the same year was appointed to the position of Chief Traffic Manager, Cape Government Railways. When at the time of the Union of South Africa the various railways were amalgamated, Mr. Clark was appointed an Assistant General Manager, which position he still holds.

MR. J. GOWAN CLARK.
Appointed Secretary and Accountant, Rhymney Railway.

MR. G. CRESSWELL CLARK, O.B.E.
Assistant General Manager, South African Railways.

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The Yellow Pine Railway.

SOME OF THE INCIDENTS OF MOUNTAIN RAILROADING IN CALIFORNIA.

By TERENCE H. LAMBERT.

AT a certain point on the Pacific slope the Yellow Pine Railway drags its tortuous course up forest-clad sides of the Sierra Nevada Mountains, forming a connecting link between the tall timbers against which the lumberjack makes his ceaseless onslaught and the busy saw mill down below.

The pursuit of the nimble but necessary dollar has cast my lot in close proximity to this railroad during the greater part of the last year, in one capacity or another, and I have been an interested observer of the humours and hazards of the life of the railroad man in the wild and woolley West.

To compare the Yellow Pine to, let us say, the Great Western Railway, is to compare a steeple-chase to Rotten Row, and in the same way that a good horseman in a steeple-chase should be heedless of danger, even so is it necessary that the man who earns his monthly cheque by riding on the Yellow Pine log train should have the resigned frame of mind of one who already considers himself lost. Indeed, it is only as a last resort that any sane man who elects to work upon this line, and so it happens that the employees are, for the most part, of the flotsam and jetsam of the railroad world. It goes without saying that the pay and opportunities to be had up in the mountains are not to be compared with that afforded on the big trunk lines ; but it also goes without saying that men rarely come into the mountains for the sake of their health. Should a man be " fired " from one of the big lines, for any sort of misconduct, he is blacklisted, and is in future a marked man, known wherever he goes. In certain cases he may become reinstated after an interval of good conduct : in other cases this is impossible. These men drift into the backwaters and side-tracks of the profession ; and for such the Yellow Pine Railway is a haven of refuge, where you can see a former conductor who was found to be colour blind, and incapable of differentiating between his employers' money and his own, working in the same crew with men who have fallen from responsible positions through drink.

The length of the line from the uppermost camp down to the Saw Mill is 25 miles. In places the curves are very acute, so that to a person riding up on the tail end of a string of empty cars the engine appears to be passing in the opposite direction, almost within arm's reach, and as the upper end of the line is some 2,500 ft. higher than the lower, it will not surprise the reader to hear that in places the grade is in the neighbourhood of six per cent. Although all the up-going trains consist of empty cars only, yet the locomotives have to be of special design to tackle these excessive grades. There are two types in use on the Yellow Pine, the Heisler and the Shay. In both of these a tremendous tractive force is exerted, for the power of the cylinders is transmitted to every wheel on the engine and tender by means of a driving shaft, running the length of the locomotive, and bevel gearing. The Shays have three cylinders placed in a vertical position just in front of the cab on the right-hand side of the boiler, which is slightly staggered, and drive direct on to a shaft which runs along that side of the engine, universal joints providing for the movement of the bogies. In the case of the Heislers, on the other hand, the driving shaft runs along the centre of the engine just above the axles, and the cylinders, which are two in number, are placed at an angle of 180° to each other and drive from either side of the boiler.

Round about the end of March every effort has to be made to establish communications with the Camps at the upper end of the line, in order that the logging may start as soon as the melting of the snows will permit. For the greater part of the way the track runs along the north side of the mountains. Here the snow lies deep, and snow-ploughs, aided by men with shovels, are used to push a way through. In many places large trees have

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fallen across the track, as though they had sacrificed themselves in a futile effort to shield their brethren from the woodsman's axe.

As soon as the line is clear the loggers get to work, and it is not long before the first log trains are coming down the hill. Then there is more trouble, and the section bosses (men who care for the track) begin to tear their hair in desperation, for the softness of the ground loosens the track and derailments are the order of the day.

Not that derailments are anything unusual in the ordinary way. Indeed, the trains seem to have a rooted aversion to keeping in the straight and narrow path. However, to anyone who takes a stroll along the track with his eyes open, this is not a matter of surprise. In one place the ties are rotten, in another the tie plates are missing: here the angle irons are cracked, and there the spikes are loose, so that he will soon be wondering by what accident a log train ever gets to the bottom of the hill without straying off into the surrounding country.

The cars which carry the logs are 40 ft. long. Upon these the loaders place the logs in two piles, leaving a space of about 4 ft. in the middle of the car. Chains passed over the piles keep the logs in place; one or more loose logs placed on top of the chains keeping them tight. It sometimes happens that in rounding a curve or negotiating a bad piece of track the top log rolls off, which makes it very advisable to treat a passing log train in the same way that you would a skunk —give it a wide berth. More than one man who failed to do this has been flattened out. Only the other day the possibility of such a fate was brought home to me very forcibly. Working as an electrician for the company, I had been engaged in mending the telephone wires, when one of the log trains came down, and as it passed I stood watching it at a point where the line makes an acute bend. The next day one of the cars of the same train was derailed and wrecked at the same place, scattering a bunch of logs over the spot where I had been standing. Had I been there then, I should not be here now.

The average train consists of from twelve to sixteen cars. Of course, as long as the engine can keep the brakes pumped up, and can pull the train over the levels (which are few), there is no limit to the number of cars that may be taken down at a time, but they rarely exceed sixteen. The load on each car averages about 10,000 board feet of lumber, a board foot signifying a slab of wood a foot square and one inch thick; each load weighs from 30 to 40 tons. The logs are newly cut and sappy, which accounts for their great weight. This varies according to the species of tree from which the logs are cut. Thus the butt of a sugar pine is so heavy that they will sink in water, but a white fir log of similar dimensions would be considerably lighter.

The air brakes are in action all the way down the line, and sometimes the wheels of the cars get so hot that they smoke. The conductor and his two brakemen ride on the logs, over which they often have to clamber while the train is in motion to set the brakes, which bears me out when I repeat that only men who are set upon suicide earn their daily bread on the Yellow Pine.

The brakes are, fortunately, not in the habit of failing, but they do sometimes. They did last August, and I believe the men who were on that train will remember it for quite a long time. It happened this way. About a third of the downward journey had been completed, and a point had been reached where the grade began to get steeper, when the driver found that for some unknown reason the train would not respond to the air brake. He hardly had time to realise this before they had gained such momentum that it would have been useless to apply the hand brakes. The train was now roaring down the hill with the cars reeling from side to side like a lot of drunken men; seeing which, the crew decided (unanimously) that it would be simply looking for trouble to stay with that train. So they all jumped, and came off scatheless. Well, the train continued in its onward rush, until it came to a sharp bend. Here the impact of the heavily-laden cars was too much for the outer rail, which keeled over, the cars crashed down the bank and into the brush, piling themselves into an indistinguishable mass of logs and splinters. When the crew had pulled themselves together and arrived at the scene of the wreck, they found that the engine, which had parted company from the cars at the critical moment, was waiting for them on the track just round the corner.

The company have been very lucky during the last year, in that several such wrecks have taken place with practically no loss of life. But there are those who are inclined to think that such a run of luck is too good to last.

Peculiar accidents sometimes happen in the woods that could never possibly happen elsewhere. When the "fallers" have

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dropped the trees, the limbs are cut off, and the "buckers" come with their long saws and cut the trunks into lengths of 12, 14 or 16 ft. Now it happened some time ago that a bucker was engaged in sawing up a large yellow pine trunk that was lying on the hillside. Just below him the line ran through a small cut, and below the line there was a precipitous drop of nearly a thousand feet down to the river canyon. It also so happened that a locomotive with a box car and meat car was coming down the track at about the time in question, followed closely by a light engine. Meanwhile Joe, the bucker, continued his labours and the hillside resounded with the rhythmic stroke of his saw, but he had neglected to block up the trunk, as he should, to prevent it breaking loose. So it came to pass that the first engine with its cars had no sooner gone by, that 25 tons of good yellow pine came pitching down the mountain side, jumped end-on over the cut, and landed its nose with a thud on the outer rail, bulging it out in a half circle. As Joe gazed down upon his handiwork his swarthy Mexican countenance was covered with an expression of innocent surprise. This little battering ram of his was 50 ft. long and over 4 ft. across the butt, and had it landed squarely on one of the cars, upon which there were a number of men, it might have sent the whole thing bowling down the mountain side, to come to rest among the rocky boulders of the river far below.

Another little incident that tickled our sense of humour at the time, but which, again, might have had more serious results, was connected with the use and abuse of what is known as a "derailer." For the benefit of those not versed in such things, it should, perhaps, be explained that a derailer is an appliance shaped something like a ploughshare which can be thrown over the rail; when in this position, any car or engine that might break away and start off on a joy ride down the mountain would find itself in the ditch on encountering the derail. Derailers, as can be easily understood, are excellent things when used for their legitimate purpose, but their use out of season is not to be recommended. Old "Baldy," the conductor on the upper end, gave us a demonstration of the improper use of the derailer, which was gratuitous as far as we were concerned, but which cost the company quite a bit of money. My partner and I were putting in a new telephone by the side of the line for temporary use, when down came Baldy with his log train. The engine was pulling a string of loaded cars and pushing two or three in front. Baldy was perched on the rear of the front car. A few hundred yards below us was the derailer over the rail, all ready for business. Down came Baldy and his train. Three car lengths, two car lengths—then the horrible thought of the derailer struck him like a clap of thunder, and he converted himself into a whirling semaphore in his efforts to signal to the driver to stop. But all in vain; the fireman was not attending to his business and the engineer was filling a grease cup. Baldy is on the shady side of 65, but prides himself on his youthful vigour. And he proved it; for at the moment that that car hit the derailer and was hurled off the track he gathered himself together, and shooting upwards and outwards, did a standing long jump of which any athlete might be proud. The front car was wrecked and the second one derailed. As soon as Baldy had picked himself up he came along to where we were working. In the ordinary way a conductor gets "fired" right off the reel for such negligence, and he knew it. We made the last connection, and he rang up the dispatcher and said, "Well, Mr. Sparkes, I guess I'm through." However, *Baldy was shorthanded* at the time, and that is probably why he is still working for the company.

During the afternoon of that day we assisted the train crew and some of the lumberjacks to put things in running order again. The chief difficulty was to get the front car back on to the track again—no easy matter, as its nose was deeply imbedded in soft earth at the side of the line, while the front bogie was nearly amidships. However, we eventually succeeded, after rolling the load of logs off down the hill, and running out the steel cable from the "Bull" donkey, which happened to be near.

A wreck such as this may not appear at first sight to be a matter of much consequence, but when it is remembered that all the logging operations in the woods are dependent upon a steady supply of empty cars at the loading landings, and that directly the supply ceases the chutes get choked with logs curtailing enforced idleness on the part of the donkey crews and loaders, it needs no stretching of the imagination to realise that the bill for overhead expenses run up by a block on the line may very quickly assume alarming proportions.

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The mountains through which the line runs are full of deer, and the train crews, travelling up and down as they do, often catch a glimpse of them. During the deer season last year, which extends from August 15th to October 15th, I was timekeeper at a camp where one of the train crews lived. In the evenings a few of the men would go over on to the other side of the lake with their rifles on the off chance of getting some venison. One night I heard some distant shots, and shortly afterwards a brakeman came rushing into my room, half covered with blood, and looking as though he had just committed a murder. However, he only wanted the loan of a hunting knife, as he had shot a deer and had broken his pocket knife in cutting its head off. The blood-stained and decapitated carcase was outside, the centre of a little crowd of men, who were examining it by the light of a lantern, and smacking their lips at the idea of eating something different from beefsteaks.

The "hogger" (as they call an engine driver here) on one of the engines last year was a confirmed sportsman. As soon as the day's work was finished he could nearly always be seen making for the river decked out in waders and with creel and rod, and when on duty he always carried his rifle slung on a couple of nails in the cab of the engine, evidently determined that it should not be his fault if he missed a shot at a deer or squirrel.

Which reminds me that one day we ran over a skunk. Phaw! He must have been a grandfather skunk—to judge by the smell of him. In going back along the track to get some men to come and fight a fire. I came upon him. He was evidently badly hurt in the back legs, as he was unable to climb over the metals, and wallowed about in the middle of the track. The air was rank with the peculiar nauseating odour that members of his tribe emit, and as I was determined to take no chances with the gentleman, I gave him a wide berth and passed him by on the other side. One of the men who came along shortly afterwards put him out of his misery with a shovel. This skunk behaved in the same way as the Irishman in the story. He had been in danger from being run over by a train, and, instead of leaping to one side, had sprinted down the track in front of the engine. When asked the reason for his strange behaviour, he replied, "Begorra, 'twas on the thrack that I could be runnin' the faster."

Not long ago a conductor who had decided to quit the job, went down to town, and backing into the manager's office, said, "Pull the pin, pull the pin"—a reference to the old days of the link and pin coupling. The manager, who seemed a little peeved with such behaviour, looked at him with some displeasure and said, "Say, if you don't cut out that fresh business right now, I won't give you a service letter." "Right you are," replied the quitter, "don't you ever tell anyone that I worked on your goldarned railroad, and you can be d——d sure I shan't."

You may send the "Railway Magazine" post free to the troops by handing it in at any post office in the British Isles.

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How Engine Drivers are Trained.

A LAD desirous of becoming an engine driver enters the service of a railway company as an engine cleaner. In the course of his duties as such he becomes acquainted with the various working parts of a locomotive, abundant opportunities being afforded for seeing an engine dismantled, opportunities which are greatly increased if he is deputed to work with the fitters. It may thus be said that his training as a fireman commences as soon as he starts work in the shed.

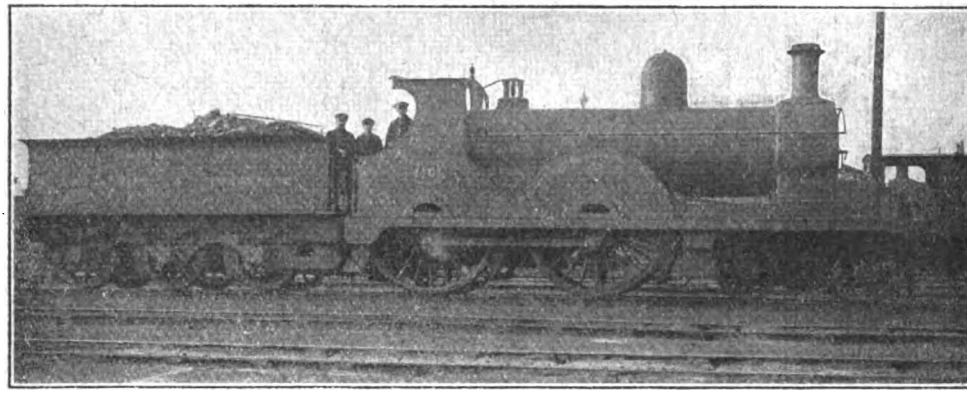
In addition to the knowledge gained in this manner, lectures are delivered by the chief foreman, the subjects of which cover a wide field of locomotive working, slide valves, valve motion, lubrication, etc., being fully dealt with. This is followed by a short course of practical training on the footplate of an engine working a local goods train, where, acting as "third man," he is under the guidance of men of experience.

On completion of this course, and provided he is of suitable age, the fireman-to-be has to pass an examination by a Locomotive Department Inspector, who travels with him whilst acting as fireman, and reports on his capabilities. At the same time he has also to satisfy his foreman that he thoroughly understands the working of the automatic vacuum brake, and thoroughly understands that portion of the Book of Rules and Regulations which will affect his duties as fireman. Having passed these tests satisfactorily, he is promoted to fireman, and commences on a shunting engine, gradually taking his place on more important work.

His term of service as fireman varies with the fluctuations of traffic in the district where he is employed, but the man whose chance of promotion at his home station seems very remote may apply to be transferred to some other depôt, where the demands for men may be greater.

The next step to promotion comes in his appointment to engine turner; in which capacity he deals with engines on the shed, and he is able to obtain his first experience in handling a locomotive on his own responsibility, and is occasionally called upon to relieve men who have been unable to complete their pre-arranged duty without exceeding the fixed limit of 12 hours. His next position is that of shunting engine driver, after which he is eligible for the "Extra Link," where he must hold himself in readiness to take up duty at short notice, as soon as his legal rest period has expired.

Having passed through the "Extra Link," the engineman becomes successively driver of local goods, local passenger, express, goods and finally express passenger trains, and there is no doubt that the reputation of a



Photo] [*W. H. Whitworth.*

LANCASHIRE AND YORKSHIRE RAILWAY.

4–4–0 locomotive, No. 1101, at Newton Heath.

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railway company depends a great deal upon the ability of the driver and fireman. The two results to be attained, whether as driver of local goods or express passenger trains, are the maintenance of punctual running time and economy in fuel consumption, and, strangely enough, the two subjects bear close relationship to each other, as it is obvious that good management results in punctual running time being made with the lowest possible fuel consumption.

The footplate of an engine is the only place where experience can be acquired of the ways in which it is possible for an engine man or an engine to go wrong. During the time that an engine is under steam with a train, everything seen, heard, felt and smelt, is capable of affording a lesson. The eye is trained to distinguish different colours at considerable distances, the ears to detect the slightest variations in the "beats" and "knocks" of an engine, the difference between knock of an axle box and knock of a journal, shocks, oscillations, etc., due to defective road distinct from those due to defective engine.

Before, however, an engineman may take his turn amongst the "Extra" men, he must "know the road," *i.e.*, be in a position to certify that he is well posted in the geography of that portion of the line over which he will be called upon to work. Obviously such knowledge can only be obtained by actual experience in passing over the line, and nothing but the most intimate knowledge of the positions of the various signals and the trains they control, the contour of the track, the different sidings and crossings leading to them, in addition to the position of water troughs, water columns, etc., will be accepted as evidence of his capabilities. Then there is the question of speed limits, and various regulations made to meet the requirements of the Board of Trade, which must be carefully noted. During his firing career he will have gradually become acquainted with a large portion of these, but in order that he may become fully conversant with the various districts, he is given a footplate pass, which permits him to travel as third man on the footplate of an engine working in the area, the geography of which he wishes to learn.

Having obtained sufficient knowledge of the various routes, he must give a certificate to that effect by signing what is known as the Route Book, which is under the supervision of one of the responsible officers at the steam shed. This certificate only holds good so long as the man is continually passing over the section of the line for which he has previously signed, and must be cancelled when he has not travelled over the line for a period of six months. Should he be required to work over a portion of the line of which he has not an up-to-date knowledge, the working of the train is taken over by a "Pilotman," *i.e.*, a driver who has a thorough knowledge of the road. An excellent practice is adopted on the London and North Western Railway of acquainting drivers of alterations in the position of old or the establishment of new signals, by issuing a printed diagram giving details of such alterations. This is of great assistance to the driver, but does not relieve him of the responsibility of taking a pilotman should he doubt his ability to readily interpret any signal at a glance.

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YOUR FRIEND
IN THE FORCES.
SEND HIM A
RAILWAY MAGAZINE.

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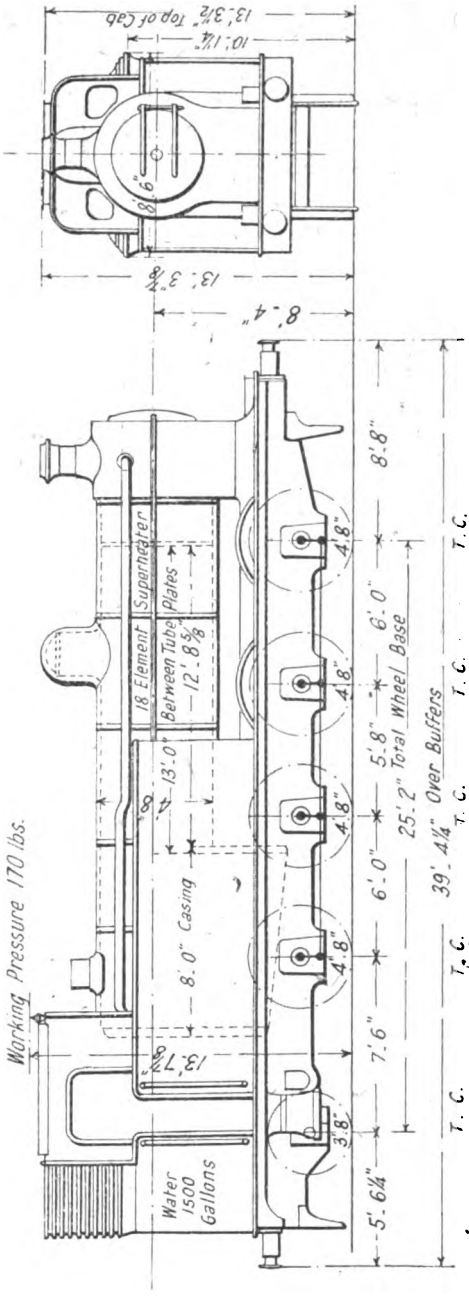
Superheater Tank Engines—Great Northern Railway.

RAILWAY MAGAZINE readers will appreciate the courtesy of Mr. H. N. Gresley, Chief Locomotive Engineer of the Great Northern Railway, by which we are enabled to reproduce a diagram drawing of one of the 0–8–2 type tank locomotives of that company as now in service.

Engines of this class were originally constructed at Doncaster for working passenger trains in the London district, and for use particularly in the service passing over the Metropolitan section to the terminus at Moorgate Street. As first built the side tanks were longer and of greater capacity than at present, their length being reduced after a period of working for the purpose of restricting the weight imposed upon the track on the Metropolitan section.

At a subsequent period the engines were removed from the London district and taken off passenger traffic altogether, and for some considerable time they worked in the coal and goods marshalling and hump yards at Colwick, where their powers of rapid acceleration and freedom from slipping served them in good stead. The boilers are of the same proportion as those fitted



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to some of the 0-8-0 type goods and mineral engines with tenders on the Great Northern Railway, and in certain other respects also they resemble those engines. The efficiency of the locomotives has been further increased by the addition of superheating apparatus.

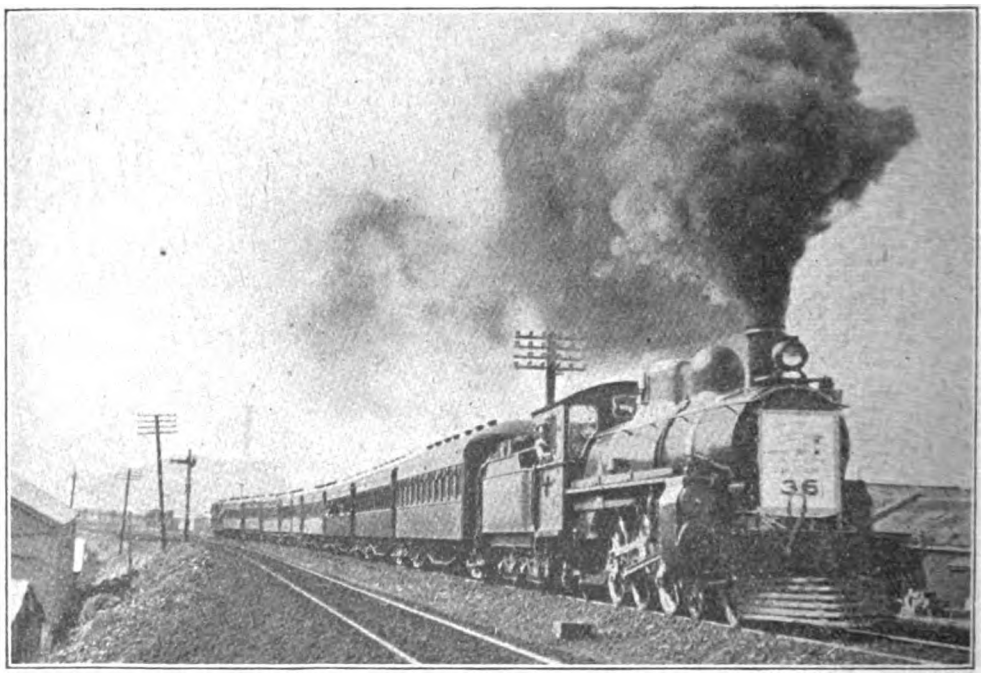
Mr. Gresley states that the conversion to superheating was comparatively a simple matter, as it only involved the fitting of a superheater boiler in the place of the old boiler and the addition of a Wakefield mechanical lubricator equipped with anti-carbonising device, by which the oil from the lubricator is delivered into the centre of the steam pipe immediately above the steam-chest and there atomised. The engines are fitted with balanced slide valves of the Richardson type, and beyond fitting the lubricator referred to above no special arrangements were necessary to prevent undue wear of the valves through the use of superheated steam.

Engines of this class, fitted with superheaters, are being employed for working coal trains between Colwick and New England, Peterborough, a distance of 47 miles. Saturated steam engines are unable to perform this service owing to the fact that the side tanks are not capable of carrying sufficient water. The leading particulars of the locomotive are as follows :—

Cylinders, diameter ..	19½ in.
Piston stroke	26 in.
Coupled wheels, diameter ..	4 ft. 8 in.
Trailing ,, ,, ..	3 ft. 8 in.
Total heating surface ..	1,417 sq. ft.
Grate area	24·5 sq. ft.
Boiler pressure	170 lbs. per sq. in.

The total water capacity of the tanks is 1,500 gallons. The distribution of weight in this locomotive is shown in the accompanying diagram drawing, and it will be noticed that of the total weight of 72 tons 4 cwt., 60 tons 8 cwt. are available for adhesion. The engine, as seen, is equipped with automatic vacuum brake apparatus and steam sanding gear, and may now be regarded as of thoroughly modern design.

A NEW ZEALAND TROOP TRAIN.



Photo] [*W. Stewart.*

MILITARY SPECIAL LEAVING AUCKLAND.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. Before asking for information concerning railway history and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," a new edition of which has just been published, price 5s. net. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

Swiss Federal Railways.

Taking the time-tables of 1914 (summer), the longest non-stop run is that by a "Train-de-Luxe," viz., Zurich–Ragatz, 60·2 miles in 119 min. (continuous uphill grades) run daily for three months (2 runs daily). The longest by ordinary steam services is that from Olten to Berne, 41·62 miles (14 daily runs), the best in 67 min., over undulating gradients of 1 in 100 to 1 in 250; and by *electric* traction that of Spiez–Brigue, 44·2 miles in 84 min., over gradients of 1 in 37 for half distance—2 runs daily. The fastest in the country is that of Lausanne–Geneva, 37·28 miles in 50 min. (7 daily runs), speed of best 44·6 miles per hour, over undulating gradients of about 1 in 200 to 1 in 100. Trains do not run through between Lucerne-Bellinzona, 105¾ miles, as stated by you, but stop at Erstfeld and Göschenen to attach and detach a second engine. Distances in *miles* between Neuchatel–Yverdon Junction, 22·4 miles; Zurich–Landquart, 64·30 miles; Berne–Lucerne *viâ* Langnau, 59·38 miles; Berne–Lucerne *viâ* Olten, 76·21 miles (through carriages are handled this route); Bale–Zurich *viâ* Brügg, 54·91 miles.

[Reply to "HELVETIA."]

The "Biggest and Most Powerful Engine in England."

This burning question is often put to us, but is not easy to answer, as there are various bases on which size and power might be reckoned. The heaviest and longest tender engine extant is the Great Western Railway 4–6–2 No. 111, *The Great Bear*, weighing with tender 143 tons in working order and measuring 71 ft. 2 in. over buffers. The longest and heaviest tank engine is the London, Brighton and South Coast Railway 4–6–4 No. 327, *Charles C. Macrae*, weighing 98 tons and measuring 50 ft. 5 in., closely approached by the Great Central Railway 0–8–4 and 2–6–4 tanks, weighing 96¾ and 96½ tons respectively. On the other hand, the greatest nominal tractive effort that we can trace is exerted by the 0–8–4 Great Central Railway banking engines just referred to, which amounts to no less than 36,100 lbs.

[Reply to "CHING"]

Locomotive Works in the United Kingdom.

Principal railways in this country have their locomotive works located as follows: London and North Western Railway, Crewe; Great Western Railway, Swindon; Midland Railway, Derby; North Eastern Railway, Darlington; Great Northern Railway, Doncaster; Great Eastern Railway, Stratford; Great Central Railway, Gorton (Manchester); Lancashire and Yorkshire Railway, Horwich; London and South Western Railway, Eastleigh; South Eastern and Chatham Railway, Ashford; London, Brighton and South Coast Railway, Brighton; North British Railway, Cowlairs (Glasgow); Caledonian Railway, St. Rollox (Glasgow); Glasgow and South Western Railway, Kilmarnock; Great Southern and Western Railway, Inchicore (Dublin); Great Northern Railway (Ireland), Dundalk. See the "Railway Year Book."

[Reply to "CHING."]

"Roaring" Rails.

The phenomenon of rail corrugation to which you refer is one for which a thoroughly satisfactory explanation has never yet been found. The roaring sound occasioned by the passage of trains over lengths of these rails is due to an undulatory deformation of the rail-head, developing from wear. The "crests" only average from 2 to 3 in. apart, and the difference in level between "crests" and "hollows" is minute, not generally exceeding 1/100 in. In all probability the

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defect is due partly to the character of the steel and partly to the character of the formation at the place concerned, as successive batches of rails laid at the same point have been known to develop the same characteristics.

[Reply to J. G. I.]

London and North Western Railway Gradients.

Gradient on Sutton branch line, between Proof House signal box and Vauxhall station, Birmingham, is not the steepest on the London and North Western Railway. By reference to the "Railway Year Book" you will find the steepest gradient on the London and North Western system over which passenger trains run is 1 in 30, and situate between Atherton and Chequerbent. The steepest gradient on a goods or mineral line is 1 in 8¼ for a distance of 770 yards at the Middleton incline, and 1 in 8 for 550 yards at the Sheep Pasture incline, both on the Cromford and Parsley Hay branch; these inclines are worked by stationary engines.

[Reply to F. J. RAYBOULD.]

Superheating.

You are quite right in supposing that the addition of superheating apparatus to a locomotive does not in itself increase its power, although rendering possible a saving in fuel and water, by the fact that the engine may be worked at a shorter cut-off without fear of undue condensation. But advantage is often taken of the latter fact to increase the cylinder capacity of the engine, and if this is done without a proportionate reduction of the working pressure, the nominal tractive effort of the engine is thereby increased. We are unable to understand your second question.

[Reply to "CANADIAN."]

A Contractor's Railway.

Line you refer to is 1 mile 21 chains in length. It was built by the Midland Railway Company under the Act of 1864 for the use of the contractor for the Bedford and London section of the Midland line, to enable him to get material on to the new line from the London and North Western Railway's line. It has never since been used.

No information can be given in reply to your second question, but if you like to raise it again after the war something may then be said on the subject.

[Reply to J. H. S.]

Valve Travel.

Difference referred to represents a slight fault in the valve gear, and is not intentional. The practice is to endeavour to get the lead equal at both ends if possible, and where the rods are long, and everything is favourable, it is possible to do so, as in the case of the 2-8-0 class engines, where equality is obtained. Failing this, the practice is to make the best compromise possible, and to keep valve openings and cut off as nearly equal as possible.

[Reply to C. R. G.]

London and South Western Railway Exeter-Plymouth Section.

The heavier London and South Western locomotive types are not worked beyond Exeter, as they exceed the permissible loading over underline bridges. Dining cars do not run forward from Exeter, both from the standpoint of convenience in working, and also because there would not probably be sufficient patronage on this section to justify the extra mileage. Sleeping saloons are owned by the London and South Western Railway, but are not at present in use.

[Reply to "L. & S.W.R."]

St. Pancras Express Train Services, Great Eastern Railway.

You are evidently unaware that the Great Eastern Railway for many years operated certain of its Cambridge line express trains into St. Pancras station, Midland Railway, *viâ* the Tottenham and Hampstead (Great Eastern and Midland) Joint Line, and running powers thence over the Midland main line from Kentish Town. The service is at present suspended owing to war conditions. [Reply to A. H. R. CLARKE.]

Gradient Profiles.

We are afraid that there is little possibility of any member of the public being allowed to consult official gradient profiles, especially at such a time as the present. But details of vertical rise, etc., may easily be calculated from the various profiles that have from time to time been published. See rules at the head of these columns as to not exceeding two questions being answered from any one correspondent.

[Reply to J. D. THOMSON.]

Brakes.

In cases where a passenger engine employing the steam brake is working a train of vacuum brake-fitted stock, both brakes

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are applied by means of a combination ejector on the footplate. In answer to your second query, brakes are very rarely applied for long periods at one time, as thus they would probably skid the wheels; braking is generally effected by a series of applications.

[Reply to "ATLANTIC."]

Record Railway Runs.

You are right in supposing that the fastest authenticated run in this country was made by the Great Western Railway on May 9th, 1904, in working an Ocean Mails special from Bristol to Paddington, 118½ miles, in 99 min. 46 sec., and also in stating that the 4–4–0 engine *City of Truro* attained 102·3 miles per hour in the descent of Wellington bank earlier in the same journey.

[Reply to ERIC L. CRICKMAY.]

4-6-4 Tank Engines, London, Brighton and South Coast Railway.

It is stated that the London, Brighton and South Coast authorities contemplate additions to the two existing engines of this type as soon as circumstances permit of their construction. The two previous 4–6–2 tanks have given satisfaction, but the 4–6–4 design was introduced in order to afford additional bunker space, and more flexibility of wheelbase at the trailing end.

[Reply to J. W. LEWARNE.]

London and North Western Railway Half Backs.

There is no London and North Western Railway rolling stock now running with half backs to separate each compartment. There may, however, be one or two old North London Railway vehicles working about the system for use as workmen's coaches or something of that kind, but these are small in number and very old stock.

[Reply to CECIL T. BILLING.]

Aberdeen, New Joint Station.

Re-construction of Aberdeen Joint station was illustrated and described in the RAILWAY MAGAZINE, October, 1915. Among other details, the article included the information that the platform lengths in the old station extended to 4,247 feet, whereas in the new station the total length is 11,340 feet, the largest platform, No. 6, being 1,596 feet long.

[Reply to DAVID L. THOMSON.]

Records in Miniature.

The average speed of the Eskdale Railway is lower than that of the Tal-y-llyn Railway, the 7⅛ miles' journey between Ravenglass and Boot being allowed 50 min., but the gauge of the former line is only 15 in. The Eskdale would also probably carry off the record in the matter of minimum staff, the total winter staff being only seven persons.

[Reply to F. Y. & N.]

The Injector.

It is quite impracticable for us to deal with so extensive a subject as the injector in the limited space afforded by these columns. You should consult such a book as "The Locomotive of To-day" (Locomotive Publishing Company, 2s. 6d. net), which fully describes and illustrates all such locomotive details.

[Reply to T. KENNEDY.]

Distant Signals.

The London and North Western Railway does not employ any distinguishing feature for the lights of distant signals at night time. Distant signals relating to diverging lines for which a reduction of speed is necessary are at present being largely dispensed with, and we presume the case you cite to be one of this character.

[Reply to A. H. R. CLARKE.]

Midland Railway Locomotive Numbering.

Shed numbers of Midland engines are those given below the number of the engine on the smokebox door, the small numbers on the side of the cab relating to the power classification of the engine, which has been dealt with previously in these columns. Sheds on the London, Tilbury and Southend section of the Midland Railway are not yet numbered.

[Reply to G. AIANO.]

Beddington Lane Station, London, Brighton and South Coast Railway.

This station, originally known as Beddington, was built when the Wimbledon and Croydon Railway was made in 1853. At that time it was considered a suitable spot, being midway between Mitcham Junction and West Croydon, so that the accident theory advanced in your query is hardly correct.

[A THORNTON HEATH READER.]

Locomotive Sheds.

Space cannot be spared for complete lists of various railways' locomotive sheds. If any RAILWAY MAGAZINE reader will compile lists of London and North Western and

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Great Western sheds and forward them, on your behalf, with postage, we will re-post them to you.

[Reply to "THORN."]

"Slip" Roads.

When a connection is made between two lines of rails crossing one another, the switches of which lie between the end crossings of the "diamond," the whole is known as a set of slip roads, single or double according as the connection is given on one side or on both sides respectively.

[Reply to J. D. THOMSON.]

Feed-Water Heating.

The function of a feed-water heater is to raise the temperature of the feed-water, by the use of exhaust steam or other means, before it enters the boiler, in order that thereby the consumption of fuel necessary to convert the water to steam may be reduced. [Reply to G. CHAPMAN.]

3-Cylinder Simple Locomotives.

Engines of this type on the North Eastern and Great Central Railways have the three cranks arranged at angles of 120° with each other, it being claimed that more perfect balancing is secured in this way than with the four-cylinder arrangement.

[Reply to J. F. P.]

The Largest Signal Gantry.

The signal gantry south of Rugby, London and North Western Railway, with its 44 signals, is undoubtedly one of the largest in this country, but we are unable to say without extensive research whether it claims the premier position in this respect.

[Reply to A. W. VAN DER MEULEN.]

Valve Gears.

We have not the space to enter into the technical discussion invited by your queries. Why not consult one of the various treatises on locomotive construction now published, which would doubtless give you all the information you require?

[Reply to A. E. BAKER.]

Caledonian Railway 4-6-0 Engines 938-943.

These engines were illustrated and their dimensions given in the April RAILWAY MAGAZINE. They take their share of express passenger traffic on the Caledonian system, including occasional working into and out of Buchanan Street station, Glasgow.

[Reply to HAROLD H. COX.]

4-4-0 Locomotives.

Even a firebox of large capacity will not save an engine that is deficient in boiler or cylinder power, but other things being more or less equal, as they are in the cases cited, the engine with the bigger firebox is bound to be superior to the others.

[Reply to N. E. R.]

Locomotive Indicating Shelters.

What you describe as a "box-like structure" is doubtless an indicating shelter. You will find one on a London, Brighton and South Coast Railway tank locomotive, illustrated and described on page 150, March, 1918, RAILWAY MAGAZINE.

[Reply to J. ANDREW.]

4-4-2 Express Engines, London, Brighton and South Coast Railway.

Tender engines of the "Atlantic" wheel arrangement on the Brighton Railway number 10 in all, the earlier series 37–41 inclusive not being superheated, while the 422–426 series is superheater-equipped.

[Reply to ROBERT VAN DEN BERGH.]

Locomotive Power Classification, Midland Railway.

The small numbers on the cab sides of Midland Railway locomotives indicate their respective power classifications, to which we have frequently made reference previously in these columns.

[Reply to A. W. VAN DER MEULEN.]

Stationmaster's Examinations.

A candidate for the position of stationmaster on the London and South Western Railway undergoes an oral examination in regard to rules, regulations, signalling, station working, etc.

[Reply to H. G. FLETCHER.]

Irish Railway Gauge.

Normal gauge of the trunk lines in Ireland is 5 ft. 3 in., but there are others such as the Londonderry and Lough Swilly of 3 ft. gauge. Full particulars for each line may be gleaned from the "Railway Year Book."

[Reply to "THORN."]

Foreign Locomotive Working.

Engines working over "foreign" lines usually adopt the head codes of the latter when so doing. As regard your remaining queries, please read the rules at the head of these columns.

[Reply to K. A. KINDON.]

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Photographs.

Photographs of engines, trains, etc., for publication should be sent to the Editor of this magazine, and will be acknowledged if found suitable for reproduction. We do not purchase odd photographs.

[Reply to T. KENNEDY.]

Rebuilt "400" Class 4-4-0's, Great Northern Railway.

These engines have not been superheater-equipped at the time of rebuilding. We do not undertake to answer such questions as the second one that you forward.

[Reply to "KING'S CROSS."]

Great Central Railway Express Locomotives.

We believe that there is the same load rating for the large rebuilt superheater 4-4-0 engines, the 4-4-0 "Directors," and the "Atlantics," on this railway.

[Reply to "ATLANTIC."]

4-4-0 Superheater Engines, Great Northern Railway.

The first of these engines (class D1) was completed in March, 1911, and the whole series—Nos. 51-65 inclusive—followed in the same year.

[Reply to K. A. KINDON.]

Great Western Railway Running Powers.

Running powers exercised in normal times by the Great Western Railway are given in detail on page 141 of the "Railway Year Book," 1918, price 5s. net.

[Reply to A. F. JACKSON.]

A New Loop Line.

The line you mention is not completed in all respects, but use is being made of it to a certain degree.

[Reply to "RIFLEMAN."]

York Platforms.

No. 4 Up Main platform at York, as lengthened, is 1,692 ft. and No. 5, the Down Main, measures 1,575 ft.

[Reply to SYDNEY G. WARD.]

Railway Literature.

RAILWAY YEAR BOOK, 1918. [London: Railway Publishing Company, Ltd., 30, Fetter Lane, E.C.4. Cloth, 5s. net.] In popular parlance, the "Railway Year Book" with this edition "comes of age." It is the twenty-first annual issue of what long ago became the recognised standard railway reference work.

Last year allusion was made to the difficulty in producing the book consequent upon the continued prevalence of war. A further twelve months' conflict has not made the process easier. As may be imagined, the compilation of the present volume has been much impeded, while the cost of production has soared high above any figure previously considered possible.

Throughout the war the publication of the "Railway Year Book" has been more than justified by the big demand for it, particularly by engineering and manufacturing firms, Government officials and military officers, in addition to the railway service. Although the number produced in 1917 was the same as in previous years, the book sold so rapidly it was out of print by the end of August.

In the present edition the fullest possible information is given in regard to railway capital, rolling stock and other railway matters. Where certain facts and figures presented in pre-war days are omitted the reasons are obvious.

As far as the war-time regulations will permit, all the much-appreciated standard features of the book are retained, corrected down to date, and several new ones have been included. A "Railway Miscellany" has been introduced, with the object of presenting interesting railway facts and a quantity of valuable information much desired by those who make a study of railway and locomotive questions. The relations between British and Irish railways and the Government, under the Regulation of the Forces Act, 1871, are recorded from the beginning of the war.

Changes in railway *personnel* during the past twelve months have been very numerous, and as a result the lists of the names and addresses both of directors and of leading officers have been subjected to considerable revision.

A feature much appreciated in Government, newspaper and railway offices is "The Railway Officers' 'Who's Who.'" This has been strengthened by the introduction of many new biographies, while the others have been carefully corrected so that they include records of the latest activities of those railway officers who have been used by the Government for the good of the community for many purposes outside transport business. The war has proved that when men of real executive ability are required, it is to the railway service the Government may turn with the full assurance of finding them.

The cordial co-operation of the principal railway officers of Great Britain and Ireland in the production of the "Railway Year Book" is acknowledged by the Editor.

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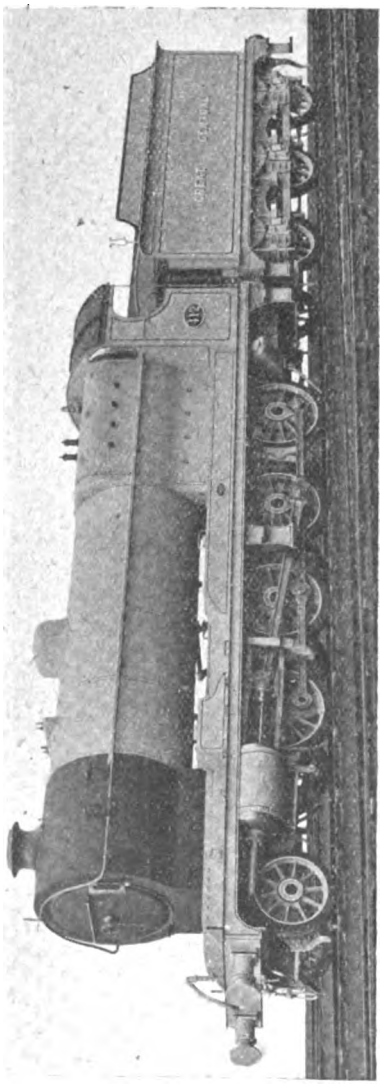
Great Central Railway.

STANDARD 2-8-0 ENGINES.



GREAT CENTRAL RAILWAY ENGINE, NO. 412.

BY the courtesy of the Great Central Railway we are able to illustrate engine No. 412, the first of a series of standard 2-8-0 engines now being built at Gorton. These engines are identical with the 8K class of mineral engines with the exception of their having a boiler of greater capacity than their predecessors in order to obtain increased fuel economy. The cylinders, rods, motion, wheels, axles, axleboxes, springs and framing are the same as those of the 8K class. It is fitted with a "Robinson" superheater and with water pick-up apparatus.

The leading particulars are :—

Cylinders : Two, 21 in. diam., 26 in. stroke.

Boiler : Barrel 15 ft., diam. outside 5 ft. 3½ in. and 5 ft. 6 in.

Tubes : Superheater elements 28, diam. 1¾ in. outside ; fire tubes 28, diam. 5¼ in. outside ; fire tubes 116, diam. 2¼ in. outside.

Heating surface : Superheater elements, 308 sq. ft. ; fire tubes, 1,641 sq. ft. ; firebox, 174 sq. ft. ; total, 2,123 sq. ft.

Area of firegrate, 26 sq. ft.

Wheels : Pony truck, 3 ft. 6 in. ; leading, 4 ft. 8 in. ; intermediate, 4 ft. 8 in. ; driving, 4 ft. 8 in. ; trailing, 4 ft. 8 in.

Working pressure : 180 lbs. per sq. in.

Water capacity of tender : 4,000 gallons.

Weight in working order : Engine, 76 tons ; tender, 48 tons 6 cwt. ; total, 124 tons 6 cwt.

This engine is similar to those sent overseas and the Ministry of Munitions decided to have this type of engine constructed for France, and no fewer than 235 of them have been ordered from various builders, all of which have been made from Mr. Robinson's drawings.

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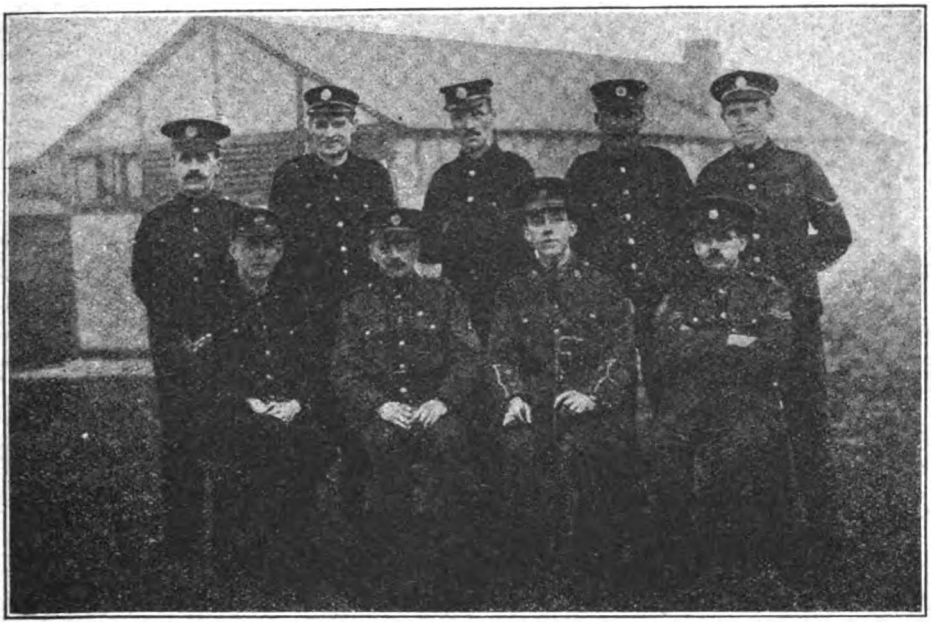
The Management and Working of a Military Camp Railway.

By CHARLES TRAVIS.

THE recent transfer of the control of Military Camp Railways to the Directorate of Movements revives interest in the management and working of these lines which, as it has been remarked, are among the most noteworthy railway developments of the war.

These railways are of two distinct types: actual camp railways, serving the varied requirements of a military encampment and, in some cases, offering a means of communication with the nearest large town; and other military railways classified for administrative purposes in the category of Camp Railways. Such are the railway systems contained in the recently-established Ammunition Storage Depôts, which have been provided to relieve the pressure on the depôts attached to the Filling Factories. It is with one of these, situated in the North of England, that this short article deals.

Whilst many railwaymen, by reason of their working relationship with such depôts, will have a good general idea of the arrangements, it is unlikely that the majority will have even the remotest conception of the arrangement. In these circumstances, a brief description of the essentials in the matter of location and design might not be uninteresting. Firstly, it is necessary that there should be facile means of communication with the main lines of railway and it is therefore usual for these depôt railway systems to be connected with one or more important artery of traffic. Secondly, elaborate safety precautions have to be observed and, for this reason, the storage accommodation is necessarily scattered. Thus, one of these depôts represents a huge area studded with magazines situated 200



Photo] [*Ingham, Bowden.*

RAILWAY TRAFFIC MANAGER AND NON-COMMISSIONED OFFICERS OF A MILITARY CAMP RAILWAY.

Top Row: Loco. Foreman, L. & N.W.R.; Chief Shunter, M.R.; Sub-Ganger, L.B. & S.C.R.; Ganger, G.W.R.; Chief Clerk, G.C.R.

Bottom Row: Traffic Foreman, G.C.R.; Inspector, L. & N.W.R.; Traffic Manager, G.C.R.; Personal Assistant.

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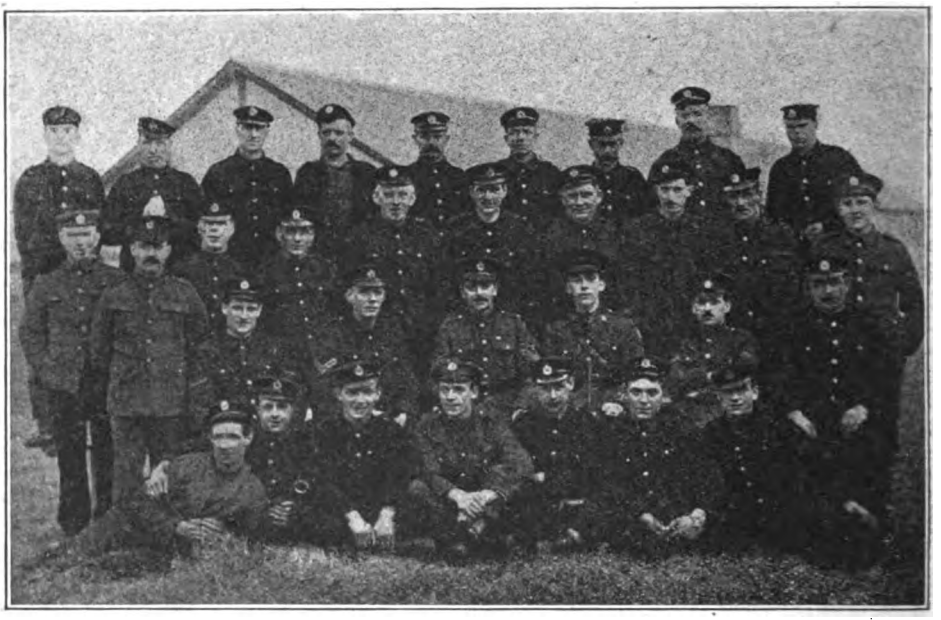
yards distant from each other and connected, of course, by the steel girdle. Where there is an insufficiency of land to permit of this space between stores, it is usual for special earth traverses to be built between the stores in order to localise the effect of any explosion.

Generally speaking, an ammunition storage depôt of this character is nothing more nor less than a big goods station. It receives the surplus output from the various factories, concentrates the ammunition in storage and issues as instructed by weekly allocations. Equally with certain classes of goods traffic for the unloading of shell in the smaller natures, gravity runways are largely utilised. The shells are placed on cradles which run down the roller runway, guided where necessary, and are then run up an inclined board if the stack is approaching its maximum height. For the larger natures, however, overhead runways have to be utilised.

With the actual handling of the ammunition, however, the military railway staff has little or nothing to do. Their work finishes when the wagons are placed in position for unloading and begins when a



Photo] *[Ingham, Bowden.*

STAFF OF A MILITARY RAILWAY.
"Somewhere in the North of England."

(but for more urgent reasons), ammunition has to be stored under certain definite conditions and with due regard to regulations drawn up in the interests of safety.

The stacking of ammunition is quite a scientific business. Definite rules are laid down for the guidance of the workers as to the maximum number of shells of each particular nature constituting a regulation stack, the amount of working space to be allowed in each store and so forth. Shells are stacked either in a pyramid or tier formation, the smaller natures (say) to 6 in. being piled on the former plan, and the larger natures, 8 in. to 12 in. and upwards, being piled on the latter plan.

wagon is loaded ready for despatch. The railway work is performed exclusively by soldiers, who wear blue uniforms for working purposes. They are all trained railwaymen, enlisted direct from the railway service, or transferred from infantry or other regiments on account of their railway experience on being placed in a relatively low category or passed fit for home service only.

The general administration of the work is vested in the Directorate of Movements under Lieut.-Col. Clow, R.E. (Superintendent of the Line, Great Central Railway). whilst divisional control is exercised by the appointment to each command of an officer charged with the supervision of the military

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camp railways in that command. Additionally, the importance of the traffic working on such a system as the one under review, the work at which is essentially different from that associated with an ordinary camp railway, requires the presence on the spot of an officer who, styled Railway Traffic Manager, acts in concert with the Command Officer in the control of the work performed by the Royal Engineers Railway Troops.

Railways of this kind have quite an extensive arrangement of track and sidings. The track—usually on the standard gauge—is generally formed of flat-bottomed rails, except in those cases where main line engines have access to the depôt; in such cases, standard bull-headed track is naturally laid in—this being passed by the main line company's engineering department before their engines are allowed to pass over the line. Fencing is a luxury only permitted in certain special cases, whilst signalling is reduced to a minimum, this generally being confined to junctions with the main lines.

On a typical railway of this character, the working of which is controlled by a trained railway officer, the practice approximates as closely as possible to main line standard. No "stunts" such as fly-shunting, riding on shunting poles and the like are permitted, whilst all the usual railway regulations are scrupulously observed. Whilst on the subject of regulations, it might incidentally be remarked that the Military Camp Railways Rules and Regulations for the Working of Single Lines of Railways on the Electric Tablet, Train Staff and Ticket and Single Staff Systems are adapted from the Book of Rules and Regulations of the Great Central Railway.

There is much of interest in the control of such a railway. Though everything, naturally, is on a small scale, many perplexing problems arise to call for careful consideration. Additionally, it has at all times to be borne in mind that the great majority of the traffic consists of ammunition, the function of which is to explode. The railway system now under review is quite self-contained. It has a fully equipped locomotive shed, properly pitted and provided for examination purposes, together with its repair shop for the execution of all ordinary running repairs. It is also supplied with the requisite permanent way materials, and carries reasonable stocks of all kinds to meet any emergency. In short, apart from the repair of any serious boiler failure, for which the assistance of a main line company has to be invoked, a depôt railway system of this kind can meet and overcome all its troubles.

It would probably be an infringement of "DORA" to give any comprehensive particulars as to the character of the traffic and the quantity handled, but it might be said that, since the recent opening, over 4,000 wagons have been received and cleared without incurring a single day's demurrage. In fact, 3,000 wagons have been cleared on the same day as received, whilst roughly 800 out of the balance have been cleared on the day following receipt.

The military railway staff performs the whole of the labelling and associated work connected with despatches and works throughout closely in conjunction with the main line company's officials. It is singularly interesting to notice the mixture of railwaymen concentrated, by the trend of events, at one location. The photograph illustrating the Railway Traffic Manager and staff on an important military railway in the North of England comprises :—

3	men	from	the	G.W. Railway.
6	,,	,,	,,	L. & N.W. ,,
6	,,	,,	,,	G.C. ,,
3	,,	,,	,,	N.E ,,
4	,,	,,	,,	Midland ,,
2	,,	,,	,,	Metropolitan Railway.
1	,,	,,	,,	L. & Y. Railway.
1	,,	,,	,,	Cambrian ,,
1	,,	,,	,,	C.L.C. ,,
1	,,	,,	,,	L.B. & S.C. ,,
1	,,	,,	,,	M. & S.W. ,,
29				

and together they form a very happy crowd. Out at all times, though care is taken to keep to duty rosters as far as possible, there is none of that unwillingness to carry on sometimes noticed. But a small detachment, worked in camp and disciplined as a self-contained unit, it comprises men varying in age from 18 to 62, the "Father" of the detachment being one of the strongest men in the party.

Altogether, it is a pleasure to exercise control over such a mixed body of railwaymen, from whom in the aggregate there is much to learn. Their varied experience in all the departments of railroad activity renders possible the accumulation of much valuable information, which should return all the men back to civil life much more efficient railwaymen than they were when they "joined up."

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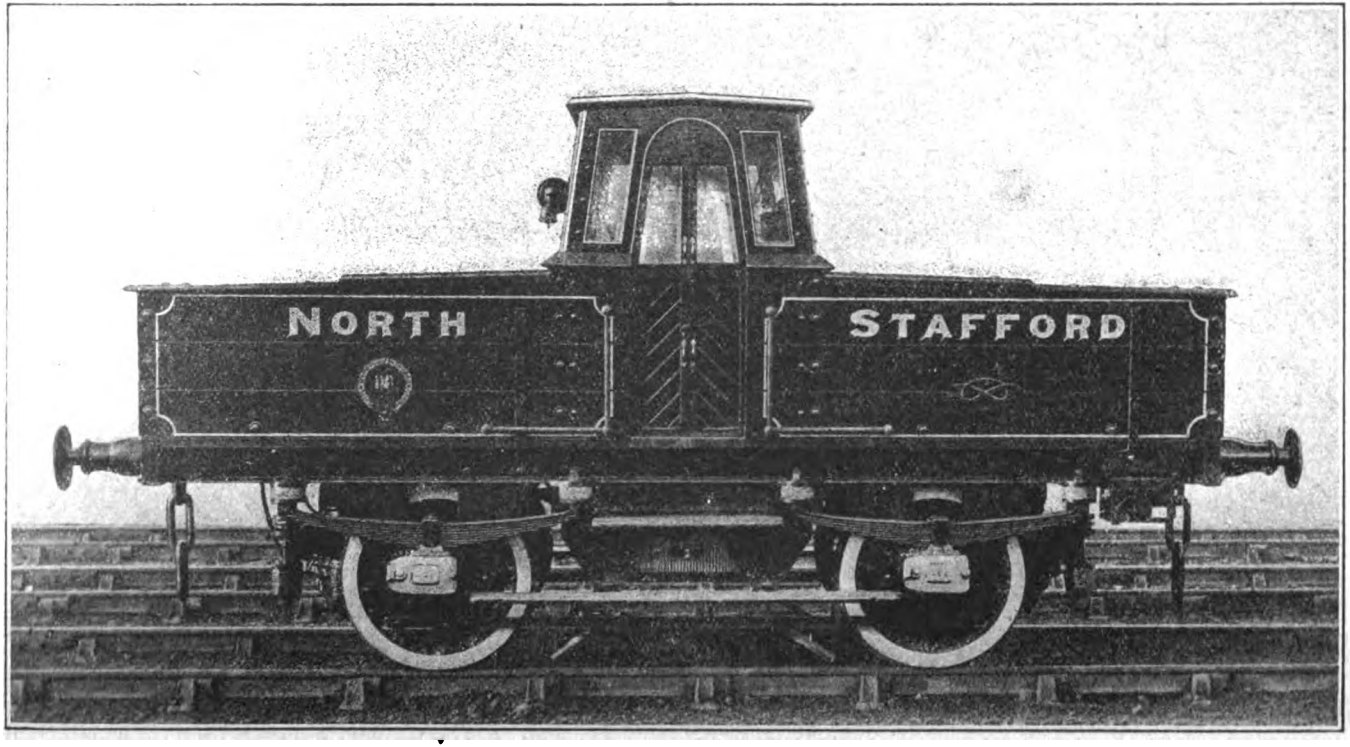
NEW ELECTRIC BATTERY LOCOMOTIVE, NORTH STAFFORDSHIRE RAILWAY.



Built at Stoke-on-Trent Works by the North Staffordshire Railway from the joint specification and design of Mr. J. A. Hookham, Locomotive Superintendent, and Mr. A. F. Rock, Electrical Engineer. The locomotive has been constructed for shunting duties at Oakamoor Copper Works. The motors are capable of hauling 90 tons, on the level, at 10 miles per hour or 72 tons at 11 miles per hour, in addition to the weight of the locomotive, which is 17 tons.

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Great Central Railway.

AMBULANCE TRAIN FOR THE AMERICAN ARMY.

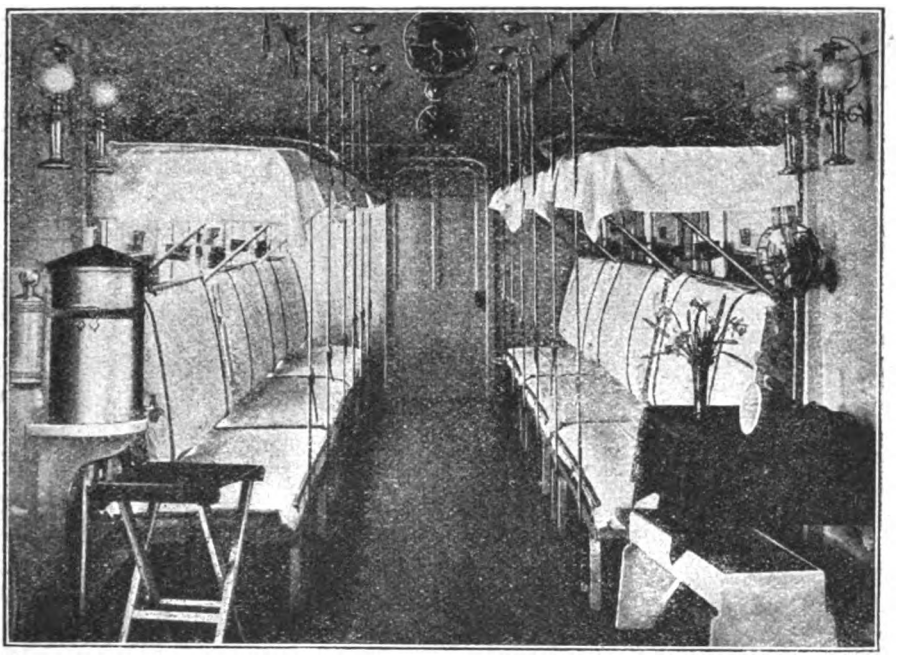
FIFTEEN ambulance trains have been built, or are in preparation, in England, for the forces of the United States of America in France, the work being undertaken as follows :—

Great Central Railway, 1 train.
Great Eastern Railway, 1 train.
Great Western Railway, 2 trains.
Lancashire and Yorkshire Railway, 3 trains.
London and North Western Railway, 4 trains.
London and South Western Railway, 1 train.
Midland Railway, 3 trains.

In the April RAILWAY MAGAZINE an exterior and an interior view of one of the trains built by the Lancashire and Yorkshire Railway were given and now two interior views of the Great Central Railway train are reproduced.

This ambulance train for the American Army was recently completed at the carriage works of the Great Central Railway, and the public have been given an opportunity of seeing it at the principal towns on its way to the port of embarkation.

The train may be styled as a "First Aid" or "Clearing" train, its prime function being that of removing the sick and wounded from the battle area rather than that of a strictly "Hospital" train.



WARD CAR PREPARED FOR LYING-DOWN AND SITTING-UP CASES.

Every convenience and comfort that the most competent military-medical officers can suggest has been provided to ensure the careful and efficient transport of the sick and wounded in contrast to the best arrangements which were available overseas in the early stages of the war. The complete train consists of 16 cars, and has a total length of 950 ft., exclusive of the engine. Accommodation is provided for 416 lying-down cases, including staff, or a maximum of 654

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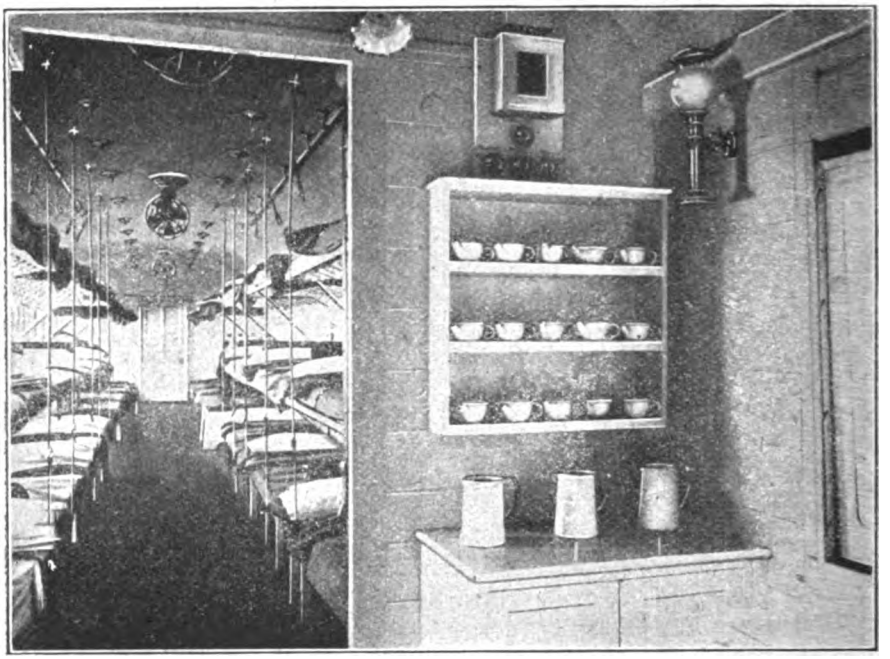
sitting-up cases, including staff. The weight of the train, unloaded, is 442 tons.

At the entrance to the ward cars, there is an attendants' compartment replete with sanitary and other necessaries. Beyond this the wards are arranged, each ward car being fitted with 36 beds. The beds have been specially designed to be used as stretchers, if necessary, and are fitted in tiers of three on each side of the car. All the beds can be folded against the sides of the car when "out of use," so as to provide fullest facility for cleaning the floors.

A further hygienic arrangement will be noticed in the rounding of the floor into the sides of the car. Another important feature is the design of the beds, the position of which can be varied to suit the exigencies of the moment. The lower beds may be used as seats, the intermediate beds lowered to form comfortable "back" rests, allowing at the same time the upper beds to be used for lying-down cases. The illustrations show the beds arranged for all lying-down cases and the beds as placed for lying-down and sitting-up cases.



WARD CAR ATTENDANT'S COMPARTMENT.

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French Railways and the War.

THE FINANCIAL POSITION.

By F. A. B.

WHAT is the position of the French railways at the present time, in view of the disastrous influence of the war on the economic situation of nations thus engaged ?

I will endeavour to deal with the problem as briefly and simply as possible, with a view to presenting the case for the benefit of those readers who are not quite clear as to the status of the French railways in relation to the State and the financial burdens accruing to the latter as a result of the war.

System in England.

If we compare the French railways with the railway companies of Great Britain, we find an immense difference in their constitution. In England the companies received their charter under various Acts of Parliament, and apart from supervision of the Board of Trade as a restraining measure, and provided they carry on their business within the statutes of their Acts, they are free from restrictions as to the methods they adopt to create revenue. In reality this is a charter of freedom of action, but in how far this freedom coincides with the interests of the State need not be examined here.

Origin of French Lines.

Now, in France the State at an early date laid its hands on the railways. In effect the State said : The needs of the nation require a line from A to B and another from B to C, and so on. In fact, it laid down certain plans for trunk lines linking up the principal towns and seaports, with a view to the economic needs of the country. It then said : I will provide the land and construct the earthworks (embankments, cuttings, tunnels, bridges), and I will give concessions to private companies to lay the lines, make the stations and provide the rolling stock. What, then, were the conditions made for the bestowal of so much generosity on the part of the Government ? Firstly, the Government laid down spheres of action for each company ; in other words, it parcelled out the country into defined areas, within which each company would alone operate, and the Government would have the right to call upon them to construct and operate subsidiary lines for the development of the said areas. Secondly, the Government laid down definite rules for the working of the lines, with a view to the co-ordination of the rates and fares, for the policing of the lines, and for the protection of the public generally. It further made it obligatory for the companies to submit to the Minister of Public Works all proposals for alterations in the rates and train services, with the right of veto, to safeguard the national interests. It finally reserved the complete control of the railways in time of war, with special rates for the conveyance of troops and war materials.

The Concessions.

We thus see that whilst the companies had a monopoly in the defined areas, there was sufficient control to safeguard the public and national interests. There are now one or two very important points to be considered, as differing from the British practice, apart from those just mentioned. The State, having provided the land and the earthworks, considered it right to limit the concessions for a given number of years, after which the railways would revert to the State free of charge as regards the fixed elements, but on payment, at a valuation, of the value of the rolling stock and equipment. The State also had the right of purchase, if desired, after 15 years from the date of the concession. Now, it could not be expected that the companies would earn a sufficient return on the capital outlay for the "subsidiary" lines which the State required the companies to build, so that some consideration had to be given, by way of inducement to develop them, even if they had to be worked at a loss.

Guarantee of Interest.

We find that the State, in these circumstances, agreed to a "guarantee of interest." This means that the State guaranteed a fixed rate of interest on the shares of each company, irrespective of the annual revenue. The guarantee carried with it a proviso that

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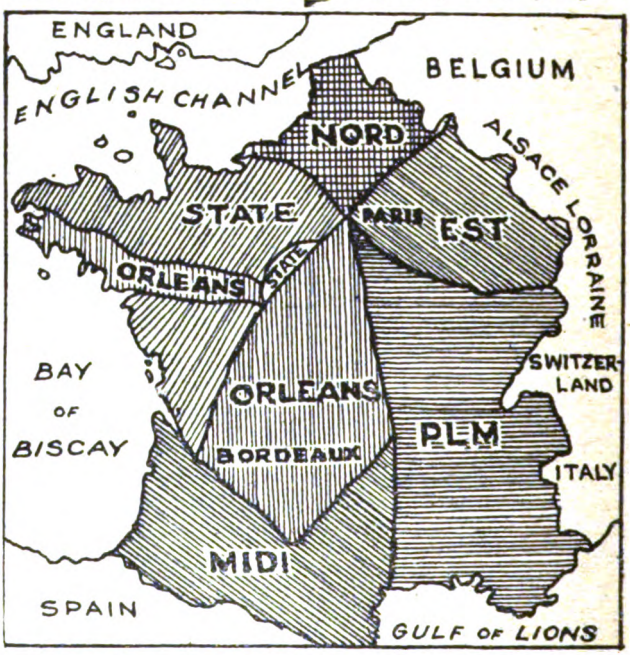
the sums thus advanced by way of the guarantee were to be repaid to the State, in prosperous years, from the surplus, after paying all charges for interest, dividends and sinking fund. It will be at once said : What inducement was there for the companies to develop their systems, when the interest was guaranteed ?

The answer is twofold : First, it was enacted that, if at the expiration of the concessions the companies owed the State in respect of sums advanced, the State would have the right to repay itself out of the value of the rolling stock. Therefore, the companies would use every effort not to be indebted to the State, and the value of the rolling stock would be in the nature of a magnificent bonus to the shareholders. It may be noted here that the concessions expire between 1950 and 1956. Second, the State only guaranteed a fixed dividend, but the companies have the right to distribute further sums to the shareholders in prosperous years, before the State participates.

There is only one company which never required State-aid, and that was the " Nord." All the others were obliged at some time or other to borrow, and some of them did so to a very large extent. In the case of the " Ouest " the borrowings were so large that the Government bought up the line in 1910 to save further indebtedness.

Position in 1914.

At the outbreak of war all the companies, except the Orleans and Midi companies, had repaid the sums advanced. In fact, in the case of the Nord and Paris, Lyons and Mediterranean Companies, the period of the guarantee was to expire at the end of 1914. The period of development, with the uncertainty of sufficient revenues, had passed, and most of the companies were able to pay good dividends and put large sums at the disposal of their pension funds. In a word, they were prosperous and, at the same time, the national interests were safeguarded.



SKETCH MAP SHOWING SPHERES OF ACTION FOR EACH FRENCH RAILWAY AS LAID DOWN BY THE GOVERNMENT.

The Effect of War.

The war has rudely disturbed this state of affairs. Huge deficits have accumulated which the State must make good, by virtue of the guarantee of interest. Of course, we should not call the deficits so startling, because in an ordinary undertaking in such circumstances there would simply be no dividend, but in the case of the French railways the shares must be considered in the light of debentures. Consequently, the railways are worked at a " loss " if the fixed dividends and the interest on the debentures

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are not covered. Thus up to the end of 1917 the total deficit amounted to about 45 millions sterling. Where is this sum to come from? It is a remarkable fact that the French railways have not increased their rates and fares to meet the increased cost of working. During 1917 a Bill was deposited in the Chamber of Deputies by the Minister of Public Works to authorise an all-round increase of 15 per cent. in the rates and fares. This Bill was thrown out by the Socialists, presumably with the idea that the companies would be able at some future date to repay the advances, as they have done in the past.

On the other hand, it is argued that such a position is untenable in the present circumstances, and that the obvious remedy is to raise the fares, as all other countries have done, *i.e.*, that the consumer should pay. There is no doubt that public opinion will compel the adoption of such increases as will put an end to the present situation, but the increase will have to be much higher than 15 per cent.

An English System of Concessions.

In conclusion, what can we deduce from the French system of railway enterprise? It has worked well in peace, and it has been successful as a war-machine. Might we not find therein the basis for some solution of the British railway problem after the war?

THE LUTON STRAW HAT TRAFFIC.

The accompanying illustration shows a portion of the down platform at the Luton station of the Midland Railway. About 1,000 packages containing straw hats are conveyed every day by

Photo] [*T. G. Hobbs.*

DAILY CONSIGNMENT OF 1,000 STRAW HAT PACKAGES AT LUTON STATION, MIDLAND RAILWAY.

passenger and parcel trains during the season from this station. The season extends from January to May, and the consignments are loaded direct to London, Manchester, Leeds, Sheffield, Birmingham, Glasgow, Bristol and other centres, and also to many intermediate points.

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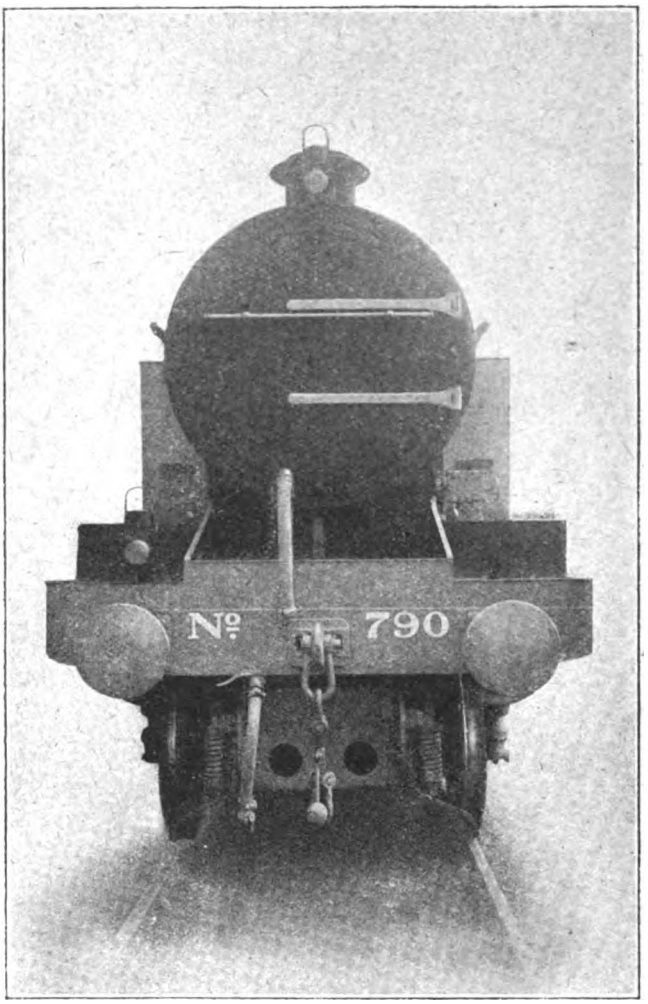

FRONT VIEW OF 2-6-4 TYPE TANK LOCOMOTIVE, NO. 790.
This engine is the subject of the frontispiece to this issue of the RAILWAY MAGAZINE.

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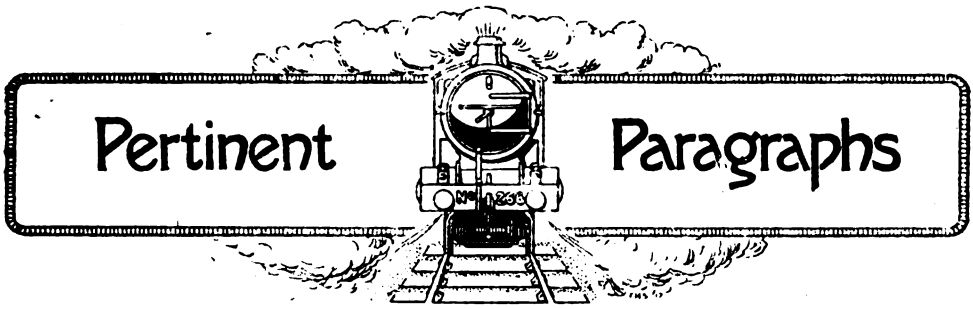

North British Railway New General Manager.

On page 300 of this issue of the Railway Magazine there appears a portrait and brief biography of Mr. James Calder, the new General Manager of the North British Railway. Mr. Calder is not without honour in his own country, and the Scottish press has had much to say concerning the popular approval of the appointment.

A Glasgow weekly paper, *The Bailie*, for April 10th, under the caption "Men You Know," gave a long congratulatory tribute to the esteem in which Mr. Calder is held north of the Tweed and likewise gave publicity to his views on the question of the purchase of the railways by the State.

From the pages of *The Bailie* the following pertinent paragraphs are culled :—

Not only has Mr. Calder a thorough grasp of all detail in the working of the North British system, but he takes wide and enlightened views on the many new problems that have emerged on railway economics. With such an able hand at the helm the conduct of affairs in connection with the North British Railway will be characterised by that progressive spirit, which will call for adequate expression, once the exacting and harassing limitations of war conditions are removed.

The outlook in railway managerial policy affords scope for interesting speculation. Mr. Calder had always taken a broad and enlightened view of the problems that were arising, in more complicated form, within the decade or so before the war. His opinions, we recall, were presented in a statesmanlike address he delivered in Glasgow, about a couple of years before the outbreak of hostilities, on the question of "Railway Nationalisation." Although the movement in favour of nationalisation had been of slow growth, there were many indications then that it was being pressed forward to a greater extent than hitherto. One of the chief causes in bringing the controversy into prominence was labour troubles, but at the same time it was recognised that the railways in the United Kingdom were overcapitalised and that there had been gross waste in connection with their construction. On the part of the trading community, there was undoubtedly a firm conviction that the transfer of the railways to the State would result in an immediate and substantial reduction in rates and fares, but Mr. Calder was of opinion that a comparison with other countries did not favour such a conclusion. He held that the question whether the purchase of the railways by the State was desirable or otherwise must be finally decided on its merits from the point of view of the national welfare. If State purchase was carried out in terms of the Act of 1844, or on a basis which would yield a guaranteed return not less than that received, the proprietors could have no reasonable objection to the transfer.

In effect, to-day, we find a State system in operation, but under conditions which give no opportunity for effective comparisons as to the relative advantages of private and national ownership. On the Continent, the State railways were to a higher degree than with us pawns in the political, military, strategic, and economic games of the nations, and it is more than probable that, in the postbellum era, the part the railways will have to play in the industrial settlement, in the redistribution of commercial activities, and even in the strategic defence of our own country will demand an entirely new outlook in railway administration and management. In Mr. Calder the North British has a manager who is alive to the urgency of the problems that will have to be faced, and who will bear his part worthily in their solution.

Post War Developments.

"Among the changes certain to take place in railway merchandise traffic working after the war will be the institution of the large capacity wagon system." Thus writes Mr. J. O. Killie, who adds :—The necessity for this change is clearly brought out in the excellent letter by "H. L. L." in the March Railway Magazine. I hope that letter will be carefully read and pondered by all the authorities concerned. The large wagon question is undoubtedly the most important one under discussion in the railway world at the present time, and the reason, as indicated by "H. L. L.," for this interest is

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obvious. The financial position of the British railways is causing grave concern to directors, shareholders and traders alike; the large increase in working expenses, wages, etc., now practically a fixed charge on revenue, is a heavy burden, and can only be met from two sources; an equivalent increase in revenue or rates. The position seems almost hopeless; it is certainly serious, as there is no visible means how a fraction of a cent. more revenue can possibly be realised from traffic under the present system of working; and the alternative of higher rates is unthinkable. The industries will, in the immediate future at least, require assistance in this regard instead of a handicap. "H. L. L." has shown how economies can be effected; how large increases of revenue can actually be earned by the adoption of, and change to, the large wagon system, whereby fully fifty per cent. more traffic could be dealt with at practically the same cost for working expenses as at present.

The heavy locomotives of the Great Central, Great Western, London and North Western and other companies are capable of hauling trains carrying a half more "revenue earning traffic" in large wagons than they are doing under present conditions; the aggregate tare weight alone of the large number of small wagons required to form a train simply overburdens the engine and wastes its usefulness. With more powerful locomotives, a natural corollary to the large wagon, the economies in working and increase of revenue would be even greater; one engine would perform the work of three at present, thereby reducing the number of trains, train mileage, trainmen, wages, etc. It is amazing how the companies have persisted in continuing the present unprofitable system of traffic working! Why should they be content with such poor results? No doubt difficulties will have to be overcome in adopting the new system wholly, but it could easily be incorporated with the existing organisation until the present rolling stock was worked out. The matter is now one of practical railway politics; the change would give new life to the railways. A beginning should be made at once; a few years would see it complete.

Dickens and the Railways.

In connection with the article in the April Railway Magazine on "Railways in Art and Literature," by Basil Mercer, Mr. James Wilson calls attention to a letter in the *Locomotive Magazine*, March, 1914. There Mr. Brewin, writing about Dickens and railways, refers to the passage in "Our Mutual Friend," where Dickens, according to Mr. Mercer, makes a mistake in saying that the signal changes from green to red for a train to proceed on its way. Mr. Brewin, who says his memory goes back almost to the publication of "Our Mutual Friend," writes as follows:—

". . . This was the condition of Settle (now Giggleswick) station, on the Midland Railway, at that time: the two semaphores were mounted on one post, and were painted red on the obverse and black on the reverse sides. . . . The block system of course was not known. The normal position of the signals was at 'all right'; they were set at 'danger' only when a stopping train was due, and for a certain number of minutes after a train (whether stopping or express) had passed. At night, therefore, they would actually shut their white eyes (green was unknown as an 'all right' signal on the Midland until 1890 or thereabouts) and open their red ones whenever a train was about to stop at the station. It is possible, therefore, that with the substitution of green for white, this is exactly what Dickens saw.—Yours, etc. (signed) Clement Brewin."

As the passage in "Our Mutual Friend" neither says nor implies that red was the "all right" signal, and green the "danger," I think, writes Mr. Wilson, you will agree that Dickens cannot be credited with having made a mistake.

Mr. C. Hill, on the subject, writes, "I myself have seen the signal changing from white to red." To this Mr. Basil Mercer responds: "See book 3, chapter 9, of 'Our Mutual Friend.'" The exact sentence is "The railway at this point, knowingly shutting a green eye and opening a red one, they had to run for it." There is no mention of white lights!

Railway Accounting for Carriage-paid Goods Traffic.

Mr. L. C. Webber Reed, Great Western Railway, Carmarthen, has published a pamphlet in respect of railway goods, mineral, cattle traffic, and miscellaneous (parcels) traffic carriage paid.

Mr. Webber's views as set forth by himself in the following paragraphs are certainly worthy of the serious consideration of "the powers that be." He writes:—

For nearly a century, the method of abstracting "Paid" goods invoices by each pair of stations, for comparison by the Audit Office, has remained unaltered. The system is that the invoice totals are abstracted and summarised monthly at the forwarding and receiving stations, the Audit Office comparing the amounts abstracted by each pair of stations, *e.g.*, Swansea forward paid is compared with Paddington received paid.

If a discrepancy is discovered, inaccuracy sheets—issued in duplicate—are sent to each station to enter on the back of the form the invoice totals, showing how the monthly totals are arrived at, the sheets passing to and from the Audit Office until the error is located.

The forward "Paid" traffic, as affecting the station debit, is of necessity very carefully dealt with and balanced, as explained further on. The received "Paid" at the other station does not affect the station debit and, consequently, is indifferently treated. The essentials at one station are non-essential at the other. It follows that the inaccuracy sheets simply reveal a large percentage of clerical errors of addition, or of invoices erroneously abstracted, not affecting the revenue. Consequently, the elaborate system of

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Audit Office check yields an inadequate return and is widely held to be more costly than it is worth.

The antiquity of this check imposed by the Audit Office would seem to condemn it, judging by the codes applied to every progressive business concern. It is surprising that advantage has not been taken of the benefits accruing from the extension system of accounting work in respect of "Paid" goods traffic gradually evolved by the most experienced and capable members of the staff, which provides for systematic allocation and balancing of the station "Paid" debit.

The procedure is that the invoice totals are entered in the daily Despatch book, extended to the several columns, *i.e.*, Cash, Ledger, Transfer, Agent, etc., cross-cast and balanced. A monthly summary of daily totals is made and each column balanced with its respective register. The gross total of the Despatch book is in turn balanced with the "Paid" total of the Forward Abstracts. Manifestly, absolutely accurate accounting results.

The writer submits that the abstracts of "Paid" traffic for local and Railway Clearing House Goods, as rendered by the forwarding stations precisely as at present, meet all the requirements; and that the receiving stations should cease to abstract "Paid" traffic. Thus, by mere simplification, or rather cessation of office routine, relief will be afforded at each of the many thousands of stations and goods depôts, the several Audit Offices and the Railway Clearing House, saving labour and expense.

If it were enacted that all rail-borne goods traffic should be consigned and invoiced carriage paid (as has been done for a portion of the Miscellaneous parcels traffic since March, 1917, with beneficial results, although it has meant the uprooting of much deep-seated prejudice), the change would be most beneficial.

The objections to all traffic being consigned carriage paid are more imaginary than real. A large proportion of the freighters already send their traffic carriage paid; many others would do so but for some trivial inconvenience. With others it is a matter of custom or entirely personal considerations, which, whatever they may be, should be subordinated to the public interests served by the removal of any burden that unnecessarily hampers railway working.

Shipping traffic is the chief difficulty. The shipping companies require the railway companies to collect at the destination station the throughout transit and incidental charges. This unpaid-for work should never have been undertaken as relief to the shipping agents.

The simplification arising from the contract and the debit being at one (the sending) station, and the consignor in all cases responsible for the charges, would facilitate dealing with outstanding and other disputed items, afford all-round office relief, and put an end to voluminous correspondence that results from want of proper negotiation by the freighters and should never have been saddled on the carriers.

The incessant office work and complication of the accounts in dealing with goods received unentered would be reduced to a minimum and the general delivery of goods would be expedited. The carmen would get away from the station sooner, and being relieved of the collection of charges would economise time on every round.

Paid-ons should be dealt with apart from the invoices by a system of transfer accounts, and charges for ropes, chains, packing, etc., similarly treated, unless it should be found practicable for these appliances to be pooled.

The accounting in respect of carriage-paid goods traffic at the forwarding station should be such as to secure and safeguard the revenue, by ensuring that every consignment would be invoiced. Theoretically, the traffic arrangements are made with this object, and want of confidence in the process is the only reason that can be advanced for the feeling of insecurity that evidently obtains and penalises the companies with heavy audit office costs, which would be unnecessary. On the whole, the work is well done as regards small consignments; but owing to laxity, the number-taking of loaded wagons at stations, works, collieries and outlying sidings is relegated to the lowest grades of the staff, often lad porters, and, as a consequence, the wagon registers are unreliable, notwithstanding they are of first importance as principal daily subsidiary checks on the invoices, which are prepared from the consignment notes.

An omission to invoice consignments could not be discovered by the Audit Office abstract check, but it is referred to to direct attention to the tightening of arrangements that is manifestly required.

Under this scheme, the staff would be liberated to concentrate their attention on detail matters directly affecting the revenue, and the effect would be highly satisfactory.

The writer is conscious that the objection will be raised that paid invoices might be suppressed; but to counteract this there are numerous subsidiary checks—the wagon registers, unentered records at the receiving stations, and many traffic eventualities such as delay, damage, pilferages, claims, and other complaints that might bring any consignment into prominence. In this uncertainty there is the desired moral check. In any system, however protected, we have, after all, to rely in a great measure upon the integrity of the staff.

This partial adoption of the scheme in connection with Parcels traffic encourages one to bring it more prominently to the notice of all concerned, especially those responsible for the management of the railways. No other commercial enterprise is burdened with such an expensive system of check as railway Audit Office methods impose. The writer attacked it as long ago as 1905, as then applied to Parcels traffic, and although his ideas were regarded as too Utopian for discussion, they were adopted ten years later by all the English and Scotch railway companies, as a war economy, as far as the Audit

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Office and Railway Clearing House were concerned.

The scheme is so pregnant with possibilities of effecting economies, that, if adopted only as a war expedient, it would not fail to commend itself as the simplest and greatest reform in railway accountancy. At this time of war peril, with the imperative call for man-power dwarfing every other consideration, this aspect of the scheme will no doubt arrest the attention of those responsible for the National Service.

Liverpool Street and the Post Office Tube.

In spite of the importance of the war news most of the London daily newspapers found space for reference to the important arbitration case recently heard at Westminster wherein the Great Eastern Railway claimed £33,393 compensation from the Postmaster-General by reason of the taking of so much of the subsoil as is required for the Post Office Tube Railway under Liverpool Street station.

The first witness was Colonel H. W. Thornton, General Manager and Engineer-in-Chief of the Great Eastern Railway, who had only just reached home from the Front. He said he saw no way of extending Liverpool Street station except by going underground. The Great Eastern must be first electrified in order to enable the main lines to properly accommodate the public traffic. Secondly, at certain hours of the day this would be insufficient, and it would be necessary to have an underground station beneath the present station to accommodate the suburban traffic. Between 8.30 a.m. and 9 a.m. as many as 18,000 passengers alighted at Liverpool Street. He had taken an average of passengers through Liverpool Street station in 1893 and 1913, and found that in 20 years the traffic rose from 92,000 passengers to 198,000, or about 116 per cent. That very large increase had taken place notwithstanding the great development in the tramcar and motor 'bus services, and he thought the increase would continue, as the working classes in years to come would probably have more to spend on travelling, it being evident that wages would not return to the pre-war basis.

If the Great Eastern Railway was to deal with its present traffic satisfactorily and creditably to itself, and with comfort to the public, it must electrify, even if there were no increase in traffic. The reasonable increase in traffic which might be expected was an additional reason why they must electrify, and they must avail themselves in doing this of the subsoil underneath Liverpool Street station. If a considerable sum of money was spent it must be spent to electrify the Great Eastern for the suburban zone. Either through connection with existing tube lines or through the construction of another independent tube line, they must provide some means of placing their passengers not only in the heart of the financial district of the City, but also to put them in the shopping districts. He had considered the possibility of effecting junctions with the Metropolitan Railway and certain other railways. The subsoil of Liverpool Street station was well adapted for a goods station, and more particularly for a cold storage warehouse. In carrying out such a work they would impinge on part of the substratum occupied by the Postmaster-General. He would infinitely rather not have tubes in their present location, irrespective of any amount of compensation that might be paid. £100,000 or £200,000 would not tempt him to give up this site. They were limited as to the height they might go above ground; there was no limit underground.

In cross-examination, Colonel Thornton admitted that there was room for an underground station, but not for the developments that he had described. The Central London tunnels were 16 ft. above those of the Post Office Railway. The top of the Post Office Railway was 55 ft. below the rails of the Great Eastern. The Central London Railway occupied one corner which had an area of one-fifth of the total area of Liverpool Street station. Witness did not agree that this railway, and not the Post Office Tube, would obstruct the building of a deep level railway by the Great Eastern. He knew the Post Office Tube started from Paddington, but he was not aware that it was under the lines of Paddington station, and that the compensation for going through the subsoil there had been decided on the conventional rate.

Mr. V. Yardley, Assistant to the Engineer-in-Chief of the Great Eastern Railway, next gave evidence. He said he had of late years made a special study of the utilisation of subsoil of railway stations. In view of the possibility of the user of the subsoil under Liverpool Street station, he had prepared a plan showing 15 schemes that would be interfered with by the occupation of this subsoil by the Post Office Tube Railway.

Institution of Locomotive Engineers.

This institution is now under the chairmanship of Mr. H. N. Gresley, Chief Locomotive Engineer of the Great Northern Railway, and he is supported by a very strong and representative committee.

The Institution was founded in 1911, incorporated on December 14th, 1915, and has already over 300 members, who are represented in the United Kingdom and Colonies, France, China, South America, etc. Its past presidents and members include the names of men well known in the locomotive world: Sir Henry Fowler (Midland Railway), Mr. A. J. Hill (Great Eastern Railway), Mr. R. E. L. Maunsell (South Eastern and Chatham Railway), Mr. Norman Lockyer (North Eastern Railway), Mr. A. D. Jones (South Eastern and Chatham Railway), Mr. A. C. Carr, of India, Mr. A. H. Panter (London, Brighton and South Coast Railway), Mr. W. W. H. Warneford (London and North Western Railway), M. G. Asselin, Chemin de Fer du Nord, and M. L. Maréchal, Chemin der Fer de Paris à Lyons et à la Mediterranée, and Mr. E. E. Lucy, Australia. Amongst representative

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manufacturers are included Sir William Collingwood, Sir W. Weir, M.I.N.A., M.I.Mech.E., Mr. C. N. Goodall, Mr. A. Campbell, Mr. C. A. Suffield, Mr. R. P. C. Sanderson, etc. The consulting engineers are also represented by Mr. Lelean, of Rendel, Palmer & Tritton.

The *Journal of Transactions* of the Institution show records of 55 papers on all branches of locomotive and carriage engineering, English and foreign, affecting general design, standardisation, various types of locomotives and carriages, maintenance and repair.

The objects for which the Institution is established are: (*a*) The advancement of the science and practice of locomotive engineering by discussion, inquiry, research, experiment and other means, the diffusion of knowledge regarding locomotive engineering by means of lectures, publications, exchange of information and otherwise; the improvement of the status of the locomotive engineer. In its "Memorandum of Association and Articles of Association" the expression "locomotive engineering" is employed in its most comprehensive sense for effecting the movement of railway or other vehicles.

(*b*) The establishment of district, branch or sectional societies, and local and other associations for the promotion of all or any of the objects of the Institution.

(*c*) The providing of legal assistance for the protection of the interests of the members or a member of the Institution in cases involving question of principle affecting the interests or status of locomotive engineers generally, and not those of the individual members or member only; provided that the Institution shall not commit any breach or infringement of the law relating to maintenance or champerty.

(*d*) The rendering of financial or other aid to the widows, wives, children, relatives or dependants of necessitous persons, or of persons who have been members.

It has been proposed, and the Council has under consideration an endeavour to effect an "entente" with the American Railway Master Mechanics' Association and Master Car Builders' Association of America, with a view to the Institution regularly interchanging ideas and experience with these Associations. The Council feel sure this would be of great mutual advantage to the Institution and the American Association, enabling, as it would, all members to readily obtain correct and official information regarding the respective practices.

Heroes of the Iron Road.

In order to give some recognition to men who have done so much to build up its fine record of efficiency, the Canadian Pacific Railway has decided on a new policy, writes a Canadian correspondent. Hitherto on the American continent railway locomotives have been identified by numbers only—a practice which has prevailed elsewhere except on certain English railways. On the Great Eastern, for instance, one famous engine was called after the Chairman of the company, *Claud Hamilton*. On the Great Western Railway, the shield over the great driving wheel carries a distinctive name—thus the giant of the line is called *The Great Bear*; there is a "Knight" class, in which the *Knight of the Garter* is conspicuous, while one well-known engine is named *King Edward*. On the London and North Western Railway a powerful locomotive is named after the Greek hero *Achilles*.

The Canadian Pacific believes that it is not necessary to go back to ancient Greece to find the names of its heroes. They are among us to-day, driving through the fierce blizzards of the Canadian winter the freight trains laden with supplies for the Allies, or the lighter but speedier passenger trains on the Imperial Highway which links Atlantic with Pacific. Take, for instance, Bronco Wilson, one of the most popular engineers on the Western Division, who won his reputation on the old Prince Albert branch, famous for having no water but lots of snow. Bronco is the cowpuncher of the "Iron Horse," and would consider it the biggest disgrace out of jail to let an engine die on the road, and if his engine was badly stalled would draw off the fires, put slabs on the top of the hot grates and, in spite of the blinding steam, caulk the tubes and light the engine up again. Achilles, the greatest of the heroes of Ancient Greece, sat sulking in his tent because Agamemnon took one of his slaves. The lack of a maid would certainly not prevent a Canadian Pacific Railway engineer from driving his locomotive to White River at 60° below zero, with the wind against him blowing fifty miles an hour. "Romance is dead," says the pessimists. "No," says the Canadian Pacific Railway with Rudyard Kipling.

"All unseen, Romance brings up the 9.15."

It has, therefore, been decided to name certain of the Canadian Pacific locomotives after the engineers, or engine drivers as they are called in Great Britain, who by meritorious conduct or by acts of special bravery have, in the opinion of the management, earned the right to special distinction. Some of these names may even be taken from the 92 engineers who are on the pension list—men like Ash, Kennedy, who grew up with the west and ran engines when the Canadian Pacific Railway was still laying tracks across the prairies—a big man physically, mentally and morally, commanding the respect both of the men and of the big officials—the father of the western engineers, and now Assistant Grand Chief of the Brotherhood. Other names may be taken from those who have passed away into the land where there is no longer need of railways—such, for instance, as Dave Bowker, identified particularly with No. 920, who for thirty-four years drove his engine without a black mark against his record. Then again, there are heroes like Norman Wight, compelled by ill-health to forsake his engine but prosperous now in another business. Seeing one day a child on the track, too late to stop his train, Norman Wight ran along the pilot and by leaning forward lifted it out of harm's way just in time. This earned the medal of the Royal Humane Society, and surely earns the right to name an engine.

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There are other Canadian Pacific Railway engineers still on duty who have done good work and whose names may soon be commemorated on some giant high type passenger engine. They are to be found on every division from St. John, N.B., to Vancouver, B.C., men fiercely loyal to their Company and to their President, Lord Shaughnessy, whom they know as the man who always gave the Brotherhood a square deal. The names of these men may not be known to the general public, for often the engineer's best record is to be never heard of, and they themselves are the last men to seek the limelight. Take, for instance, Jack Hartney, so skilful in starting that the passenger does not know the train is moving till he looks out of the window. Jack Smith, on the run between Ottawa and Montreal, is another notable character. In the days when the Canadian Pacific Railway and the Grand Trunk used to race between these two cities, Jack always claimed that he never raced, but at the same time that he was never left behind.

On the other side of the continent are Alf. Solloway, a veteran who joined the Canadian Pacific Railway thirty years ago and knows Cascade Canyon like a book; Lew Patrick, the safe man of the Selkirks, who in the old days before Rogers Pass was tunnelled, when the Canadian Pacific Railway in winter did sometimes have slides, was said to be able to smell a slide ten miles away; Willis Armstrong, another mountain man with eyes that hardly needed the headlight to see through the dark canyons, and Dan Murphy, of the Crow's Nest, a big man in a big locality. On the prairies, besides such men as Bronco Wilson, there is Con Leary, nicknamed the President—open-handed, big-hearted, and always on time; and John Pascoe, 100 per cent. efficient as an engineer, never known to have an engine failure, the man who made the success of the Cross Plough. Billy Woods is further east, a sky pilot in overalls with strong moral influence on his fellows. Alph. Bilbie and George Leach are railway leaders in Ontario, each of them steady as a clock. In Quebec there is Arthur Charlebois—known as the Snow Man who can buck a snowdrift when no one else can. Mate to him is Harry Leclerc, known as Bronze Buck, a French-Canadian worthy of his race and always on time.

Over 2,000 locomotives run in the Canadian Pacific service, with over 2,000 engineers. It is not the intention to name every locomotive at once, but only those in passenger service, and to keep each name as a privilege and a reward. The idea is one which should appeal to every man who knows the value of personality in good railroading. It appeals to the Canadian Pacific Railway because it will make for efficiency and encourage that *esprit de corps* which is the keynote of the whole Canadian Pacific system. The engineer does not think of his locomotive merely as a machine. It is something almost human to him. "She's a good engine," you hear one call to a passing conductor, "but full of hard luck." It takes an engineer months to master the peculiarities of a new locomotive, and for that reason he is not much in love with any pooling system, preferring to have one engine, at any rate, "assigned" to him—an engine that he can almost call his own. Were he to know that his favourite engine would eventually bear his own name, surely he would take greater pride than ever in work well done.

London and South Western Railway Garden Plots Committee.

In all its undertakings, great or small, the London and South Western Railway is always thorough. Reference has previously been made in the Railway Magazine to the excellent work performed, under the chairmanship of Mr. W. Buckmaster, by the Garden Plots Committee, an organisation that acts as a guide, philosopher and friend to those railwaymen in the Company's service who devote their otherwise leisure hours to the patriotic purpose of increasing Britain's food supply and thus frustrating the Kaiser's plan of starving the country by means of his undersea-boat sink-at-sight campaign. Some 7,000 of the staff have allotments, or war-gardens as they may be called, alongside the line and other ground is available free of charge on application through the usual channels. Free gardening lectures have been given in London and the West of England, and seed potatoes are being supplied to the staff at cost price. During the season spraying will be arranged for at a nominal charge to cover the cost of the chemicals. It is the intention to hold vegetable shows at the end of the season at various districts throughout the system. The Garden Plots Committee acknowledge with thanks, the ready support and financial assistance which have been given by the Board of Directors, the General Manager (Sir Herbert Walker, K.C.B.) and the other chief officers of the railway.

To supplement the admirable work of the Committee, there has just been issued gratis to the London and South Western Railway staff, who have taken up war-gardening, an illustrated "Guide for Allotment Holders." The book is neither too elaborate nor scientific, but is sufficiently informative to render very real and practical service to railway-employed plot-holders, particularly those who by long residence in towns have lost touch with problems appertaining to the soil. The book is divided into three parts; the first deals with the preparation of the land, the second the cultivation of vegetables, and the third with diseases and garden pests. Its size and shape makes it easy for the cultivator to carry in his pocket for consultation in odd moments and likewise when engaged in actual garden work. Rarely indeed is so much valuable information on any subject set so clearly and in such small space as in this excellent garden guide. The Railway Magazine earnestly hopes—and does so with confidence—that the staff of the London and South Western Railway will demonstrate its appreciation of the fine work of the Garden Plots Committee, by raising record crops for the season of 1918.

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MR. GEORGE LINTON, who has been appointed Secretary to the Furness Railway as from April 15th, joined the service at the Whitehaven office and was transferred to Barrow in 1872, continuing up to 1900 in the Accountant's office, where the secretarial business in regard to issues of capital, registration and dividends was then transacted. On revision of this arrangement he was transferred to the registration division of the secretarial department, of which he was in charge until 1911, when he was appointed Chief Assistant to the Secretary. It is worthy of note that Mr. Linton's late father was also Secretary to a railway company, having been the first Secretary and Manager of the Whitehaven, Cleator and Egremont Railway.

* * *

MR. DAVID L. RUTHERFORD, M.Inst.C.E., has been appointed Engineer and Locomotive Superintendent of the Furness Railway, combining the duties of Locomotive and Carriage and Wagon Superintendent, hitherto performed by Mr. W. F. Pettigrew, who has resigned, with his former office as Engineer. Mr. Rutherford began railway work on the North British Railway in 1890 as apprentice engineer under Mr. James Bell, M.Inst. C.E. He was appointed Chief Assistant in the New Works Department in 1905, and in 1907 District Engineer of the Northern Division, which includes the Alloa, Burntisland and Methil Docks and the Tay and other large viaducts. In 1909 Mr. Rutherford was appointed Engineer of the Furness Railway. During the last eight years the permanent way on the latter railway has been modernised, a large number of bridges have been renewed, and Kent and Leven viaducts, each over 1,500 ft. long, reconstructed. This work has all been done departmentally. Great improvements have been carried out in connection with the Barrow-in-Furness Docks and Channel, the latter having been widened and deepened for a distance of 5 miles.

MR. GEORGE LINTON.
Appointed Secretary to the Furness Railway.

* * *

MR. WILLIAM F. PETTIGREW, M.Inst.C.E., Locomotive, Carriage and Wagon Superintendent of the Furness Railway, is retiring from the service of that company. Mr. Pettigrew, who was born at Glasgow, commenced his career on the Great Eastern Railway, where he was a pupil of the late Mr. William Adams, at that time Locomotive, Carriage and Wagon Superintendent. He was afterwards under the late Mr. Massey Bromley and late Mr. T. W. Worsdell, of the same railway, the latter appointing him Assistant Manager of the Locomotive, Carriage and Wagon Works at Stratford, continuing in that position under Mr. James Holden. In 1886 he was appointed by the directors of the London and South Western Railway Manager of their works at Nine Elms, and assistant to his old chief, Mr. William Adams. In 1897 he was appointed by the directors of the Furness Railway as Locomotive, Carriage and Wagon Superintendent, which included the supervision of the steam yachts on Lakes Windermere and Coniston, the Channel steamers running to Fleetwood, the steam tugs, dredgers and barges, and the hydraulic machinery and cranes of the large docks at Barrow-in-Furness. In 1896 Mr. Pettigrew was awarded by the Council of the Institution of Civil Engineers the George Stephenson medal and Telford premium for his paper on "The Trials of an Express Locomotive." He was also the author of the "Manual of Locomotive Engineering," published in 1899, which was a standard work on that important subject. His portrait appears on the next page.

* * *

ON the North British Railway the following staff appointments took place on April 8th:

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MR. WILLIAM FRANK PETTIGREW.

Mr. John Walker, District Traffic Superintendent, Edinburgh, to be Assistant General Manager, *vice* Mr. J. Calder; Mr. J. M. Stevenson, Chief Assistant to District Traffic Superintendent, Edinburgh, to be District Traffic Superintendent, Central Section, *vice* Mr. Walker.

* * *

MR. J. PEPPER, who has held the position of London Outdoor Goods Manager for the Midland Railway since June, 1916, has been appointed London District Goods Manager of that company, *vice* Mr. D. R. Mason, who has retired. Mr. Pepper, who was born at Westmoreland some 42 years ago, commenced his railway career as a boy clerk at a small wayside station on the Furness Railway. At the age of 20 he was attached to the office of the Superintendent of the Line as Advertising Inspector. In search of experience, Mr. Pepper joined the staff of the London and North Western Railway, and soon after the opening of the Lancashire, Derbyshire and East Coast Railway he found himself attached to the General Manager's office of that railway. After about three years' service there he joined the staff of Vickers, Ltd., Barrow-in-Furness. Ten years ago Mr. Pepper entered the Chief Goods Manager's office, Midland Railway, during which period he was chiefly engaged in the reorganisation of goods terminal arrangements. On June 1st, 1916, he received the appointment which he is now vacating in order to take up the duties of his new position. Mr. Pepper's office is at Somers Town station, Euston Road, N.W.1.

* * *

CAPTAIN DUDLEY ADAMS, R.G.A., age 27, killed in action March 21st, was the elder son of William John Adams, of Sydney, and grandson of the late William Adams, who was Locomotive Superintendent of several of the English railways. He was educated at Sydney and engineering pupil of Mr. D. Earle Marsh at the London, Brighton and South Coast Railway. He afterwards spent six months each at Messrs. Vickers, Ltd., Sheffield Works, and Messrs. C. A. Parsons & Co., Ltd., Newcastle-on-Tyne Works. He served in Gallipoli, Egypt and France.

* * *

MAJOR FOSTER, at the Railway Club on Tuesday evening, April 9th, struck a happy note. His paper on "Railway Restaurant Cars" was as racy as it was full of fact and shrewd comment. At its conclusion he was much complimented upon what was, so far as the Club was concerned, his "maiden effort," and a general debate ensued in which many reminiscences of war and pre-war travel were given. Mr. W. Parker presided, and again had the sad duty to perform of proposing from the chair a vote of condolence for the relatives of a member fallen in active service. On this occasion the Club had to lament the loss of 2nd Lieut. U. P. Davies, killed while fighting with one of the London Regiments. A Club visit to South Kensington Museum, under the guidance of Mr. J. C. Cosgrave, on Saturday, April 20th, was announced. On Tuesday evening, at 7 p.m., May 14th, at the Club-house, 92, Victoria Street, London, S.W., Mr. W. R. S. Smart will present a paper entitled "The London, Brighton and South Coast Railway and its Locomotives."

* * *

ALL railway goods agents who have under their charge horses and vans should obtain a copy of the London "Safety First" Council's poster, entitled "Don'ts for Horse-Drivers." It is illustrated with four excellent half-tone pictures showing railway carmen at their work. A copy ought to be exhibited at each railway stable in the United Kingdom. Copies of this poster may be obtained, together with posters Nos. 1 and 2, in which are set forth the rules of the road, hand signals for drivers, etc., from the Hon. Secretaries, London "Safety First" Council, 31, Westminster Broadway, S.W.1.

* * *

THE article last month on the mistakes of novelists in dealing with railway matters was interesting reading—writes Mr. L. B. Hewitt—and I am reminded that during March a touring lecturer who was describing at Bath in popular fashion the manners and customs of the United States was at great pains to explain the system of double bogies employed on the American passenger rolling stock. He was evidently unaware that for at least ten years past bogie passenger stock has been the standard on the principal British railways.

* * *

WHEN on exhibition at Liverpool Street station on Tuesday, April 2nd, the ambulance train built at the Great Eastern Company's Works at Stratford was visited by 3,713 persons. On the following day the public attendance was likewise very good. Since that date the train has been taken to Southend-on-Sea, Norwich,

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Colchester, and other places for public inspection.

* * *

INTENTION has been intimated by the Glasgow and South Western Railway of promoting a Provisional Order for the transference of Ayr Harbour from the Harbour Trustees to the railway company.

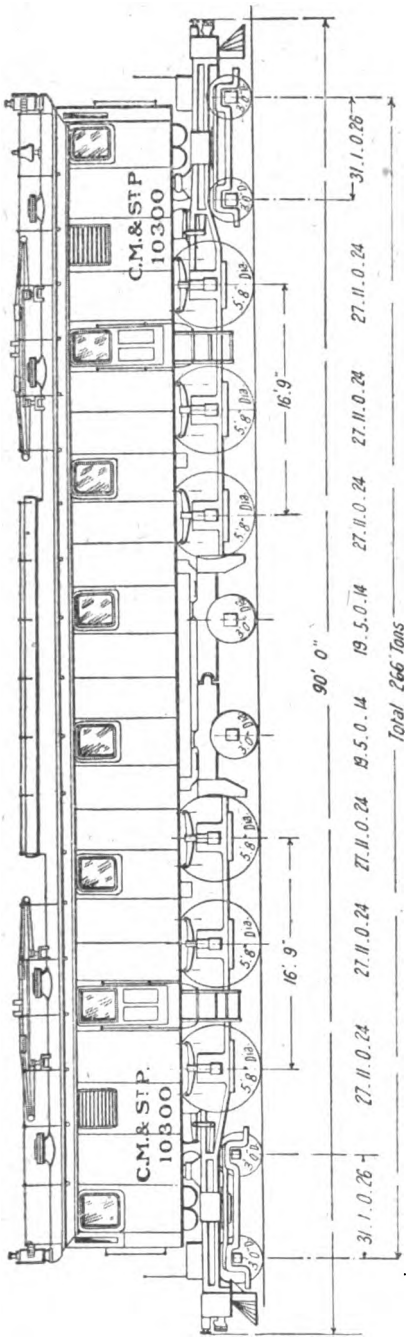

DIAGRAM OF NEW ELECTRIC PASSENGER LOCOMOTIVE FOR THE CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY.

"NATIONAL light railways in Essex," was the subject of a resolution passed by the Essex County Council urging the Government to include in any scheme for after-war reconstruction, adequate provision for the needs of Essex.

* * *

A 60-TON electric travelling crane is to be constructed and placed in the locomotive erecting shop at St. Rollox Workshops, Caledonian Railway.

* * *

FROM Crewe, Mr. C. Williams communicates: Since my last note there has been one or two changes in the stations of the Claughton locomotives. Nos. 1103 and 2338 are now at Crewe, the former transferred from Edge Hill, and the latter from Camden. In addition, No. 1327, which was temporarily stationed at Crewe, is back again at Edge Hill. The new batch of 0–8–0 superheater goods engines, referred to in a previous letter, is now in service, and is stationed as follows:—

No. 94, Crewe South.	No. 2256, Crewe South.
No. 112, Leeds.	No. 2274, Carlisle.
No. 360, Springs Bch.	No. 2290, Rugby.
No. 851, do.	No. 2296, Carlisle.
No. 2088, Rugby.	No. 2423, Crewe South.

A further batch of similar engines is in course of being turned out, of which Nos. 83, 720, 943 and 1121 are in service. These are stationed: No. 720 at Crewe South, and the remainder at Carlisle. The remaining six engines, not yet out are Nos. 750, 1313, 2082, 2167, 2172 and 2412. Referring to Mr. Reeves' list of "Prince of Wales" engines stationed at Leeds (April RAILWAY MAGAZINE, page 284), No. 877 is a mistake. This engine, at present in the works, was, until recently, stationed at Preston.

* * *

MR. K. PATON writes:—Since I last gave the sheds of some of the South Eastern and Chatham Railway large superheater 4–4–0's of Class L, there have been many changes. They are now shedded as follows:—

Shed 2. 771, 773, 775.
,, 3. 761, 763, 764, 769, 772, 777.
,, 5. 762, 766, 778.
,, 11 (Dover). 765, 781.
,, 11 (Deal). 767, 770, 774, 776.
,, 12. 768, 779, 780.
,, 19. 760.

* * *

ON the London and South Western Railway the whole of the 463–472 series of large 4–4–0 engines has now been equipped with the Eastleigh superheater, in addition to No. 421, 4–4–0; No. 490 (Urie 4–6–0, built to use saturated steam); and the 6 ft. 7 in. Drummond 4–cylinder 4–6–0 engines, Nos. 443–447 and 458–462 inclusive. Mr. C. E. Mitchell, who forwards this information, also mentions that some Great Northern Railway 0–6–0's are now working on the London and South Western line, of which he has noted Nos. 150A, 304, 312 and 1131, and are shedded at Strawberry Hill.

* * *

FURTHER to the paragraph on page 283, April RAILWAY MAGAZINE, concerning the piloting of

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trains on the Great Northern Railway, Mr. H. L. Hopwood writes:—"It might be inferred that the pilot engine goes all the way, but as a matter of fact, it is detached at Potters Bar, where a special stop is made. The practice is not confined to the 5.30 p.m., but is extended to the 2.0 p.m. and the night Scotch trains when heavy."

* * *

As a war measure to ensure coal saving and to effect other necessary national economies, many reductions in the train services in and around London will be made in May.

* * *

A RAILWAY MAGAZINE reader at Rawalpindi writes that on the North Western Railway (India), owing to the shortage of white paint, the carriages are now being coloured crimson lake.

* * *

FROM Winnipeg Mr. Norman Thompson has forwarded a list of names of Canadian railway stations and many are really curious. Take, for example, the following:—Solid Comfort, Come-by-Chance, Seven Persons, Red Jacket, Medicine Hat, Wartime and Topsail. Mr. Thompson says his list is capable of almost indefinite extension. Canadians in railway station nomenclature evidently have a liking for the queer and quaint.

* * *

CANADIAN railways, through the Canadian Pacific Association for National Defence, are exchanging traffic in the interests of efficiency. In one case the Canadian Pacific Railway diverted by way of the Soo Line one thousand cars of freight so as to relieve the main line of the company along the north shore of Lake Superior. These cars passed south from Winnipeg to Minneapolis and by way of Sault Ste. Marie into Ontario. They consisted chiefly of grain for domestic consumption in Canada. One hundred cars of freight per day are being diverted from the Canadian Pacific Railway at Quebec and travelling by way of the National Transcontinental to Halifax. While there is no saving in mileage, this, in the interest of the country, relieves the Canadian Pacific Railway main line to St. John for classes of export freight more urgently required there. In Toronto an arrangement was successfully carried out whereby one hundred and twenty cars of freight east-bound for Montreal were turned over from the Canadian Pacific Railway to the Canadian Northern Railway every day. The Grand Trunk during the winter season has been diverting one hundred and fifty to two hundred cars of coal per day to the Canadian Pacific Railway and Toronto, Hamilton and Buffalo in order to lessen the congestion on the Grand Trunk from the Niagara frontier to Toronto and other points. The Grand Trunk has also diverted fifty cars per day to the Canadian Northern Railway at Toronto. In Western Canada the Canadian Northern has on several occasions transferred surplus traffic to the sister railways in the West.

* * *

IN the annual report of the Queensland Railways, which is just to hand, some very significant figures are given in a table showing a comparative statement of revenue and expenditure for the two years ended June 30th, 1917. For the year 1915–16, after paying all working expenses, the Southern division showed a credit balance of £543,950, and for the year 1916–17 a credit of £375,233. The Central division for 1915–16 showed a credit balance of £197,260, and for the year ended June last a credit of £186,439. The Northern division for 1915–16 showed a credit balance of £260,590, and for 1916–17 a credit of £277,225. It will be seen that whilst the Southern and Central divisions showed a marked decrease in the credit balance this year, as compared with last, the Northern division, notwithstanding it is saddled with non-paying lines at Mackay, Bowen, Cooktown, and Normanton, shows a satisfactory increase in its credit balance. The gross credit balance for all divisions in 1915–16 amounted to £1,000,289, but this has dropped to £837,780 for the year ending June last. A net revenue of £837,780 is equal to £2 1s. 5¼d. per cent. on the total capital expended in opened and unopened lines as against £2 11s. 0¼d. per cent. for the year 1915–16.

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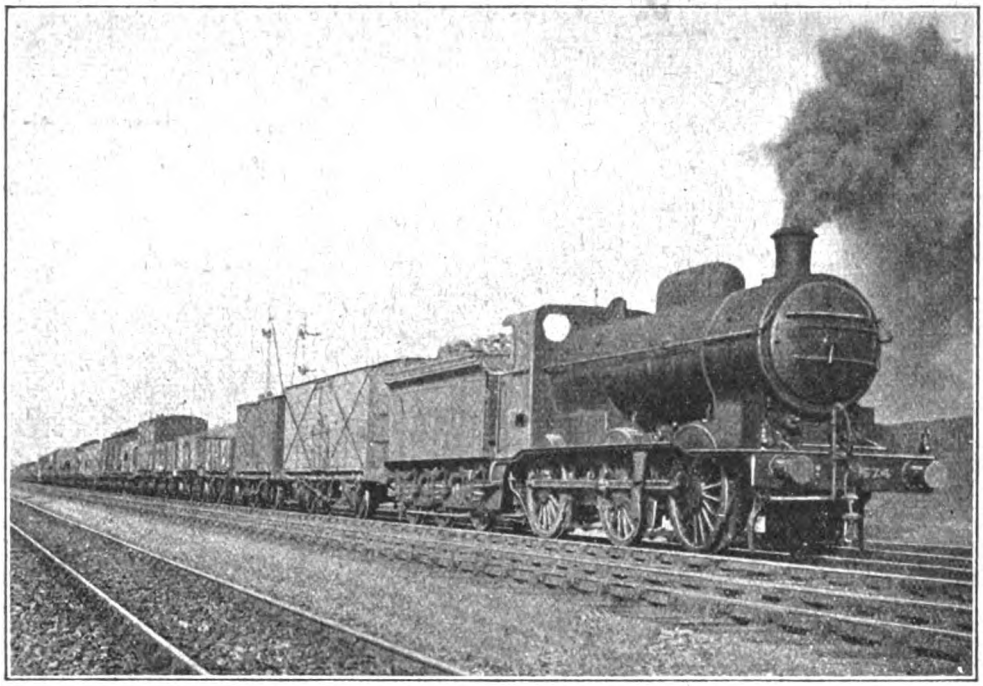

GREAT NORTHERN RAILWAY UP GOODS TRAIN BETWEEN PETERBOROUGH AND LONDON.
0–6–0 type engine with top feed device.

Practical Railway Working.

The Handling of Goods and Mineral Traffic between Peterborough and London—Great Northern Railway.

THAN the 76¼ miles of railway between Peterborough and London *viâ* Huntingdon and Hitchin there are few more important stretches of line in the United Kingdom. The volume of goods and mineral traffic passing over this section of the Great Northern Railway has largely increased during the war, and special measures have been adopted to cope with it.

The subject is of great interest at the present time, the line between Peterborough and London being one of the main arteries over which goods and mineral, as well as other traffic destined for the Metropolis and south thereof, has to pass. It has consequently been subjected to very severe tests in coping with the unprecedented traffic incidental to the war. The Great Northern main line is essentially a through route between the North of England, London and the south. A very considerable percentage of the traffic to and from the East of Scotland, the vast industrial districts of Tyne and Tees, and the manufacturing area of the West Riding of Yorkshire, passes over the system. In addition, much of the traffic to and from Manchester, Liverpool, Nottingham, Sheffield, and Leicester finds its way by this route.

A large proportion of the fish and meat traffic passing from the north to London, and also of the wool traffic from London to the West Riding towns, is conveyed by the Great Northern Railway, and the volume of these essential commodities is expressed in very large figures. The Great Northern Railway is also a distributing agent for an extensive agricultural district, and has therefore to undertake the transport of large quantities of milk and vegetable produce, much of which is for London, and for this extensive accommodation is provided at King's Cross, the potato market there being a special feature of the arrangements. Finally, it affords a channel for the very heavy traffic

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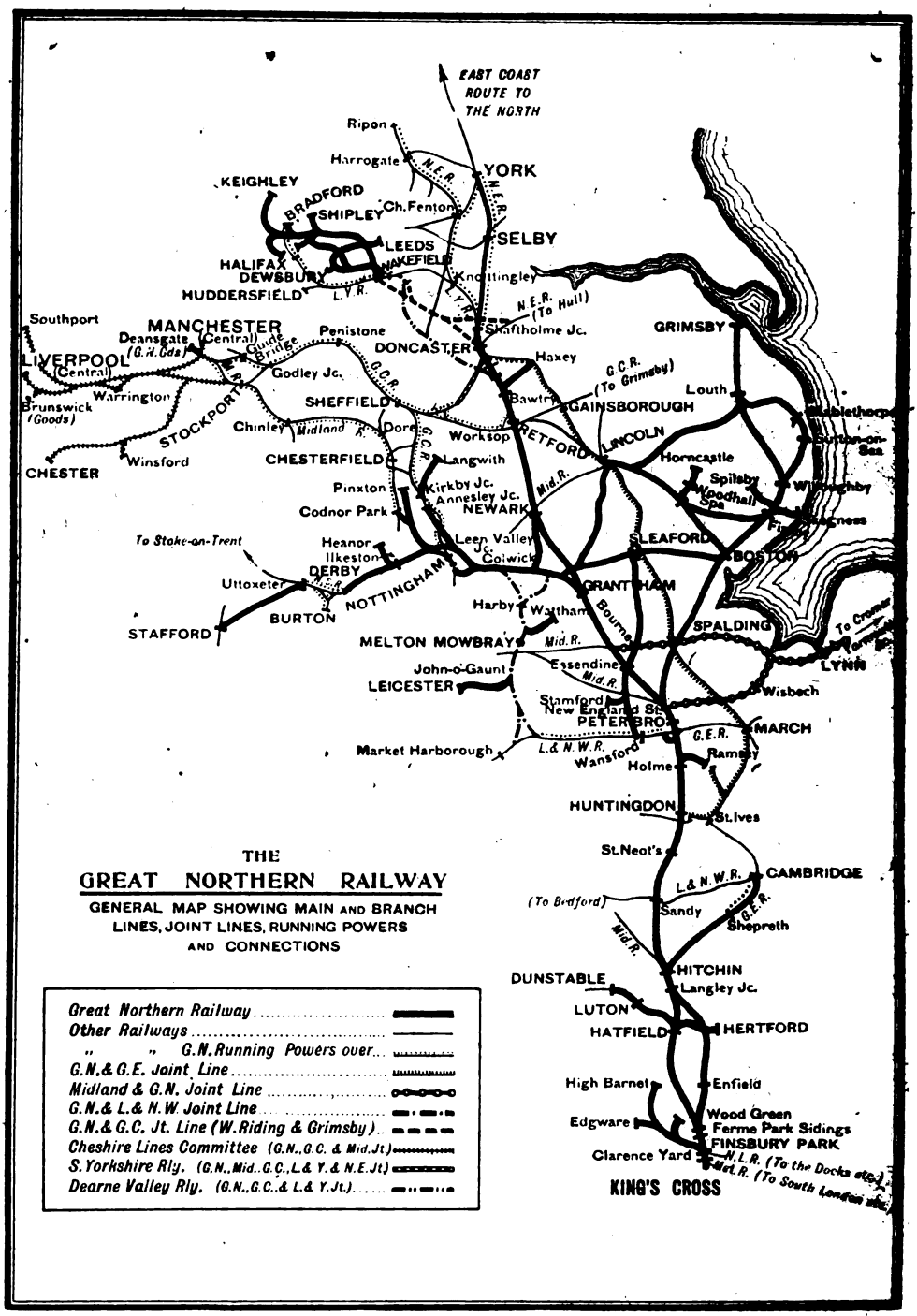

THE GREAT NORTHERN RAILWAY

GENERAL MAP SHOWING MAIN AND BRANCH LINES, JOINT LINES, RUNNING POWERS AND CONNECTIONS

- *Great Northern Railway*
- *Other Railways*
- *" " G.N. Running Powers over*
- *G.N. & G.E. Joint Line*
- *Midland & G.N. Joint Line*
- *G.N. & L. & N.W. Joint Line*
- *G.N. & G.C. Jt. Line (W. Riding & Grimsby)*
- *Cheshire Lines Committee (G.N., G.C. & Mid. Jt.)*
- *S. Yorkshire Rly. (G.N., Mid., G.C., L. & Y. & N.E. Jt.)*
- *Dearne Valley Rly. (G.N., G.C., & L. & Y. Jt.)*

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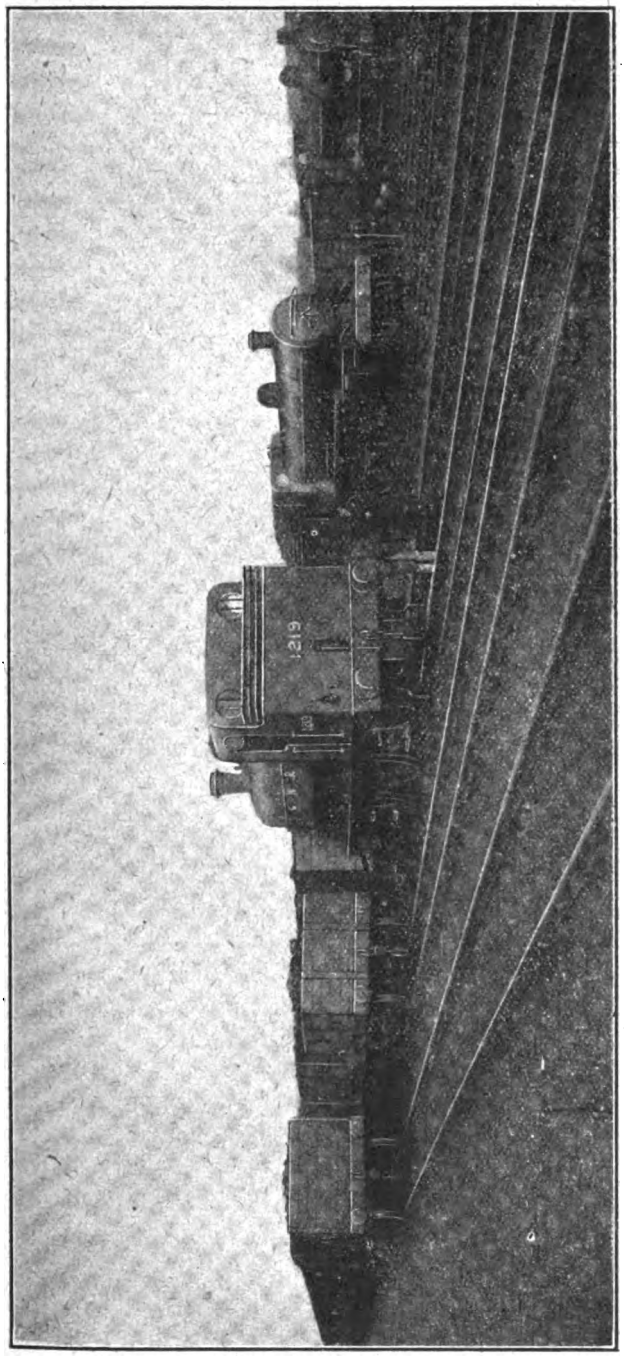
in coal to London and the South of England from the mines of Durham, Yorkshire, Nottinghamshire and Derbyshire.



TRAINS AWAITING THEIR ENGINES OR ABOUT TO LEAVE THE EAST COAL YARD AT PETERBOROUGH, GREAT NORTHERN RAILWAY.

Under these circumstances it is obvious that Peterborough, on the main line, almost equi-distant between London and Doncaster, must be regarded as a railway centre of the first importance. It is the point of concentration for the goods and mineral traffic of the Great Northern Railway between the north country and the south, and the point of reception from, and distribution to, the Eastern Counties. The up and down goods yards, known as Spital and Westwood respectively, are parallel yards situated on the up side of the main line just north of Peterborough passenger station, and together they provide standing accommodation for about 1,000 wagons.

The mineral traffic and its empty wagon corollary are dealt with at New England in up and down yards immediately north of the goods yards, the sidings for full and empty wagons being capable of receiving about 3,000 wagons. In these yards the coal trains are broken up, and re-marshalled in proper order for going forward to their destinations in London, the Eastern Counties, or the South of England, and the empty wagons returning to the collieries are sectionised and distributed to their particular geographical areas.

Between Peterborough and London the line is well equipped for its special function of carrying a large volume of through traffic, there being four lines of track practically the whole distance. The centre lines, worked under absolute block conditions, are devoted to passenger and fast train traffic, such as fish, meat, milk and other perishables, etc., while the two outer lines, mainly worked on the permissive system, are available for heavy goods, mineral and empty wagon, trains. Frequent means of passing from slow to fast lines and *vice versa* are provided enabling through trains to run round stopping trains, and thus secure the greatest possible freedom of

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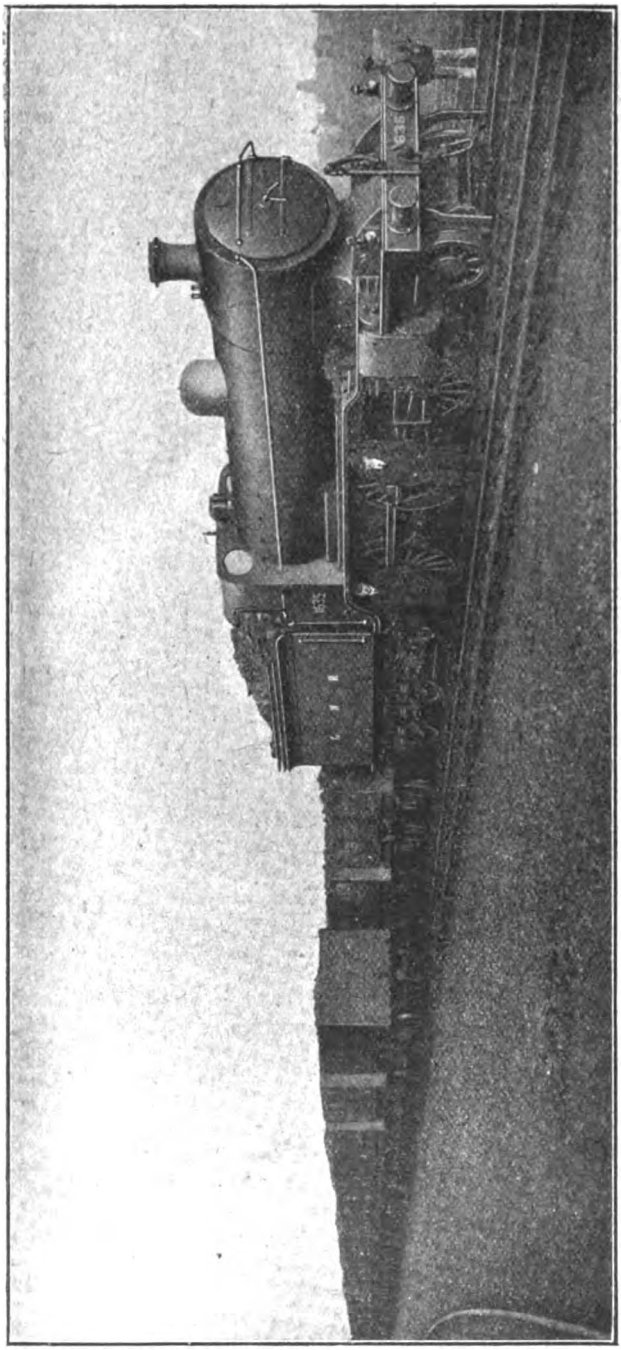
movement and the fullest use of all lines.

Arrangements have been made to bring into use the new loop line which has been constructed from Langley to Enfield *viâ* Hertford and Cuffley, this line having been opened on March 4th. It forms an alternative route to London as between Langley (near Stevenage) and Wood Green, and affords relief to the main line. For a time the loop is being worked as a single line section 15 miles long between Langley and Cuffley, and to meet the special requirements, Tyers No. 5 "absolute and permissive" tablet apparatus is being used, this being the first installation of its kind in the country.



2-6-0 TYPE LOCOMOTIVE READY TO LEAVE PETERBOROUGH FOR LONDON WITH LOADED COAL TRAIN, GREAT NORTHERN RAILWAY.

The operations at Hitchin and Hatfield in connection with the heavy traffic passing to and from the Cambridge and Luton branch lines are considerable, but special services are arranged to cover these needs, and the through traffic works without interruption between Peterborough and a point about 4 miles from London. Here are situated the Hornsey and Ferme Park marshalling yards, and 2 miles further south two additional yards, known respectively as East Goods and Clarence Yards, are located.

At Hornsey the sidings form an excellent gravitation yard, and it is here that the up goods trains are broken up. The wagons for King's Cross, Farringdon Street and the lines south of the Thames are detached, and after being marshalled into the many sections required to enable them to be dealt with speedily at these points, are despatched by direct trains. Wagons for suburban branches, for depôts in the north and east of London, and for the docks, are worked into East Goods Yard, where they are marshalled into and despatched on the services running to those areas.

The down goods traffic from all parts of London and the south is concentrated at Clarence Yard by tributary services running from Farringdon Street, Poplar, Royal Mint Street and the docks, and from the London

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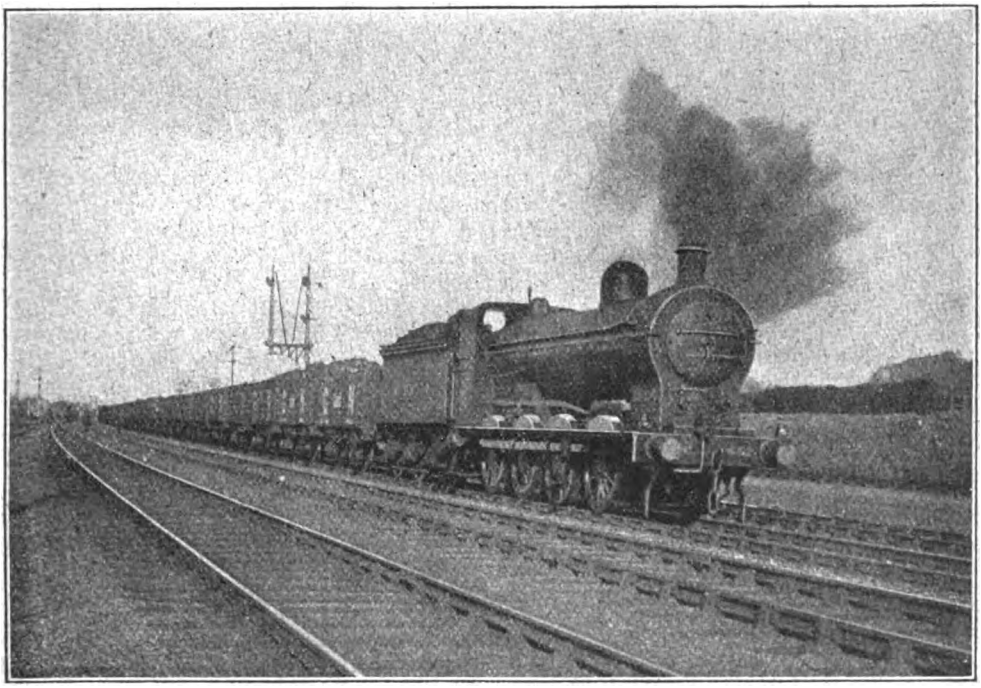
depôts of the lines south of the Thames, and the through trunk service trains to the north which start from King's Cross call at Clarence Yard to make up their loads. The use of the up and down yards at Ferme Park is confined to mineral traffic and its corresponding flow of empty wagons.

Coal trains from Peterborough terminate in the up yard, and the wagons are there marshalled into the various sections for transfer to the southern companies, and the depôts in London and the suburbs. The up and down sidings have a standing capacity of about 3,000 wagons, and the average number dealt with daily is about 2,500.

vacuum-braked express train running at 45 miles per hour to the 20 miles per hour ordinary heavy goods, each class being distinguished by particular headlights and bell signals, securing to each its special rights of precedence and effecting arrival at destination in the order required.

These arrangements in respect of class of train and service which were worked to in days of peace, when uninterrupted business was the rule, became impossible in practice after the outbreak of war. The great additional burden thrown on the railway created a very considerable strain on its resources in engine power and rolling-stock,



A TYPICAL GREAT NORTHERN RAILWAY COAL TRAIN FROM PETERBOROUGH TO LONDON.
0–8–0 superheater engine, 70 loaded wagons and brake.

The larger portion of the traffic is for the lines of the southern railways, and to transport this a practically continuous service is worked by the Great Northern Railway from Ferme Park to Hither Green, Bricklayers' Arms, Plumstead, Blackheath, Herne Hill, Lower Sydenham, Streatham, Battersea, Barnes and Brentford.

In pre-war days the transit of goods traffic between Londo and Peterborough on the Great Northern Railway was conducted by a service graded according to the class of merchandise conveyed, varying from the

and it became apparent that the situation could only be dealt with by a continuous service of heavy trains so spaced as to avoid congestion at key points and with arrivals planned to ensure the yards and sheds being always supplied but never blocked.

This involved a complete change of method. The light fast merchandise trains consequently disappeared and one standard service, goods and coal, at one common speed was instituted, with the effect of moving a greatly increased tonnage per train. The extra running time occupied by the heavier

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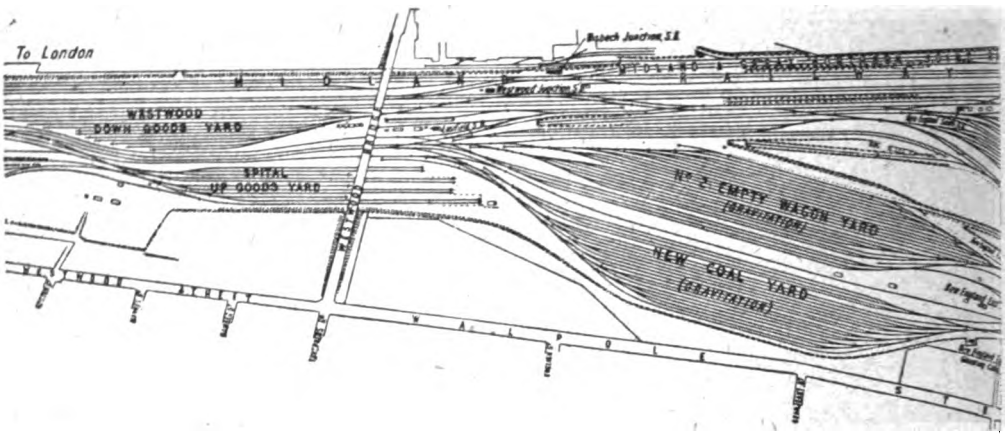
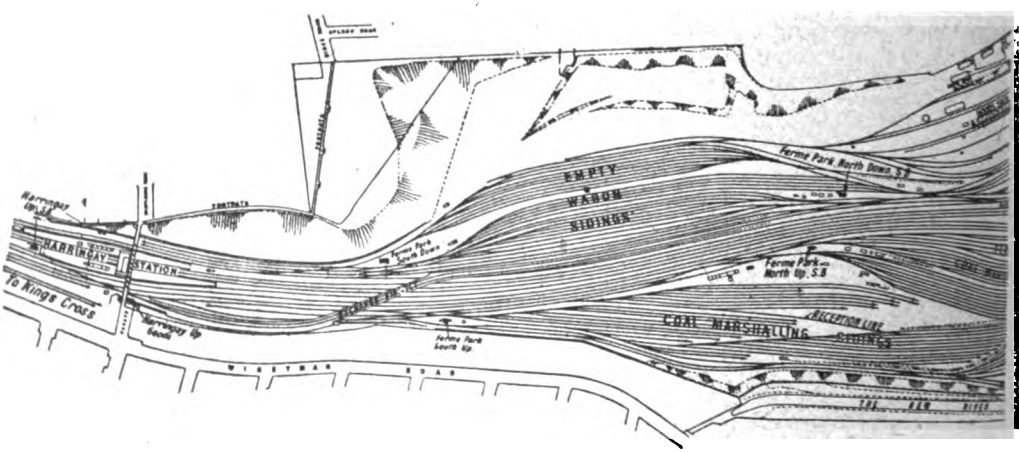


GOODS AND COAL MARSHALLING (GRAVITATION) YARDS

and slower service is compensated for by a reduction in delay through the trains being run at fixed intervals and the removal of the need of giving one train preference over another.

The daily working between Peterborough and London is a practical illustration of the altered methods adopted, and the following particulars show very clearly the methods employed in handling the traffic.

The coal trains from Nottinghamshire, Derbyshire, Yorkshire and Durham terminate at the New England yards (Peterborough), whilst the goods trains from north and east terminate at New England or in the Spital goods yard. At these points, by a broad system of sectionising, their loads are shunted out into trains with a maximum loading of 80 wagons, the coal trains being destined to Ferme Park and the goods trains to Hornsey, or the East goods yard already referred to. A continuous service of trains, goods and coal alternately, all running at one speed, is maintained at fixed intervals. The trains follow one another without interruption along the slow line, and the system of working, with additional alteration as necessary of the trains for Hornsey and the East goods yard, ensures a steady arrival of trains in the London district at Hornsey, Ferme Park and East goods yards at intervals sufficient in practice to ensure their admission to the yards without delay, and the consequent prompt release of the



GOODS AND COAL MARSHALLING (GRAVITATION) YARDS

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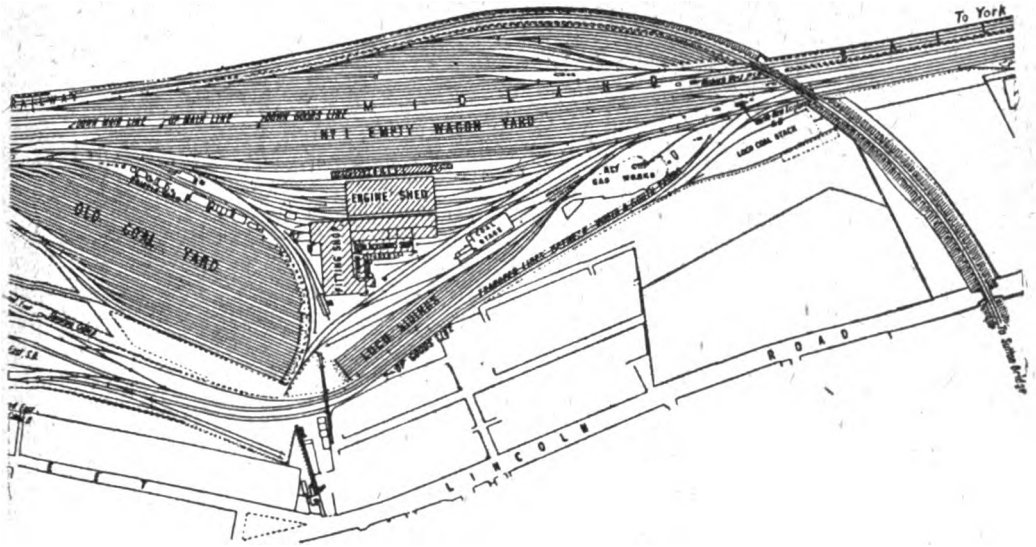
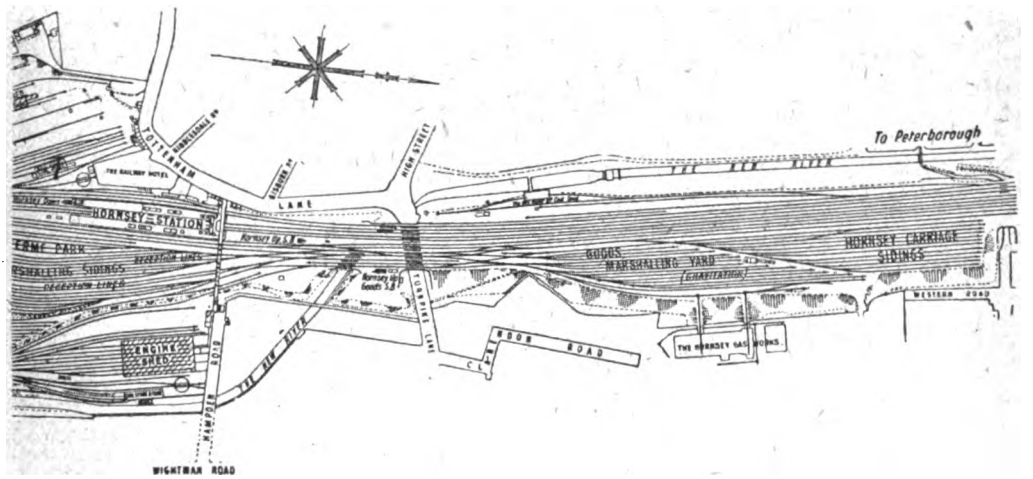


AT PETERBOROUGH, GREAT NORTHERN RAILWAY.

engines for return workings. The use of the fast road, when necessary, enables these through trains to proceed without interruption from the roadside pick-up services.

The success of a system of this kind largely depends on the capacity, not only of the marshalling and distributing depôts, but in no less degree of the terminal goods yards and sheds, for the continuous reception of wagons, and this feature has received special consideration in dealing with the traffic between Peterborough and London. It is, of course, obvious that the flow of traffic for particular yards and sheds must be kept within the limits of the capacity for handling it, including the cartage facilities, or the working would become congested and the value of the freedom secured in running be lost. The system and practice adopted to meet this contingency at certain large goods stations is as follows:—

The capacity of the station, having regard to accommodation, staff and cartage facilities is reviewed and the number of wagons which can be accepted and cleared daily settled. An "acceptance" programme is drawn up wherein the capacity of the station to deal with various classes of business finds expression, and the total number of wagons of each class of traffic which can be dealt with is allocated to particular towns or areas in which the business arises. The programme authorises certain areas to forward to the particular station a maximum number of



AT HORNSEY, GREAT NORTHERN RAILWAY.

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wagons daily. An arrangement is in force by which the district officers decide on the allocation of the wagons authorised among the stations under their control; this allocation varying day by day according to the urgency and volume of traffic offered. Authority given to forward wagons is accompanied by special labels corresponding in number, and every wagon arriving at the terminal station is examined to see that it bears its label. By this means the daily arrivals are kept to the limits within which it is possible that the whole of the arrangements shall operate satisfactorily.

The adoption of these methods has, in spite of the disabilities of reduced staff and cartage facilities, permitted the acceptance and handling of a greater tonnage than that dealt with before the war.

The Metropolitan Railway between King's Cross and Farringdon Street forms the connecting link between the Great Northern system and the southern lines.

The outstanding feature of the present working is that the volume of traffic passing between north and south of London has more than doubled as the direct result of conditions created by the war, and the problems to be solved have been not only the capacity of the Metropolitan line to carry the business, but the provision of locomotive power necessary to deal with its ever-increasing quantity. Whereas in pre-war days the Great Northern Railway's weekly transfer between the north and south of the Thames consisted of some 7,000 wagons, the figure now is more than twice as much, excluding the traffic in and out of the Company's Goods Depôt at Farringdon Street, which has also to be worked over the "widened lines" of the Metropolitan Railway.

In considering this result it must be borne in mind that the traffic which passes over the main line in trains varying from 50 to 80 wagons in load, has to be worked through London over the Metropolitan line and the steep gradient at Snow Hill in trains averaging 23 wagons.

This load, small as it seems, represents an increase of 40 per cent. over pre-war conditions, and has only been made possible by the almost continuous use of a banking engine at Snow Hill. To afford the freedom necessary to the use of this engine and increase the carrying capacity of the line, a number of suburban passenger trains between King's Cross and Moorgate Street were cancelled or diverted into King's Cross terminus, where the reduced main line passenger service has made it possible to accommodate them.

The results which are daily being achieved on the Great Northern Railway in the handling of the greatly increased volume of goods and mineral traffic passing over the system have been such as fully to justify the measures adopted, the value of which latter is particularly exemplified by the degree of promptitude and certainty with which the wagons are moved within the congested areas.

Only five of the 2–8–0 type of engines are at present available, but the Great Northern Railway has a very powerful class in its 0–8–0 type superheated goods locomotives with 20½ in. by 26 in. inside cylinders, and another very excellent series having the 0–6–0 wheel arrangement and 19 in. by 26 in. inside cylinders, these last engines being also fitted with superheating apparatus.

In addition there are numerous others of somewhat earlier but still very suitable design which sometimes work in pairs and can handle the heavy train loads under the conditions imposed and afford satisfaction.

As an instance of traffic working on British railways under the difficult conditions of the present day, the arrangements in force on the Peterborough–London section of the Great Northern Railway, and the results achieved, afford an example well worthy of attention among those who study railway traffic movements.

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Caledonian Railway.

CHANGE IN CHIEF GOODS MANAGERSHIP.

MUCH regret is felt in Scottish commercial circles at the retirement on May 31st of Mr. Duncan Cameron, the Chief Goods Manager of the Caledonian Railway.

Mr. Cameron has been in rather an indifferent state of health for some time past, and has for that reason asked the Board of Directors to relieve him of further service. Some time ago he indicated a desire to retire, but at that time he was prevailed upon to remain. Mr. Cameron, who has been with the Caledonian Railway for the long period of forty-nine years, was appointed Chief Goods Manager in 1913, and he has thus occupied this responsible position for what have perhaps been the five most strenuous years in the history of the line.

MR. DUNCAN CAMERON.

Previous to his appointment as Chief Goods Manager, Mr. Cameron acted for a number of years as Assistant Goods Manager. Prior to that he passed through the rates and claims sections of the goods department, being head of the claims section, and his experience of the work of the goods department has probably been as varied and comprehensive as that of any railway officer in the United Kingdom. During Mr. Cameron's tenure of office, he has enjoyed the confidence of the Board of Directors and the management, and his services have been highly appreciated.

The Directors of the Caledonian Railway have appointed Mr. John Ballantyne to succeed Mr. Cameron as Chief Goods Manager. Mr. Ballantyne entered the service of the Caledonian Railway in 1892 as a clerk at Beattock station; was subsequently employed at various stations on the line in the capacities of booking clerk and goods clerk, and in 1897 was appointed to the position of Relieving Agent attached to the General Goods Manager's Office; he organised the Caledonian Railway Accounts Office, Glasgow, in 1910; was appointed Chief of the Accounts Office, Glasgow, in 1911, and ultimately held the positions of Chief Clerk to the Outdoor Goods Manager and Assistant to the Chief Goods Manager; appointed Chief Goods Manager, June 1st, 1918.

Photo] [*Lafayette, Glasgow.*

MR. JOHN BALLANTYNE.

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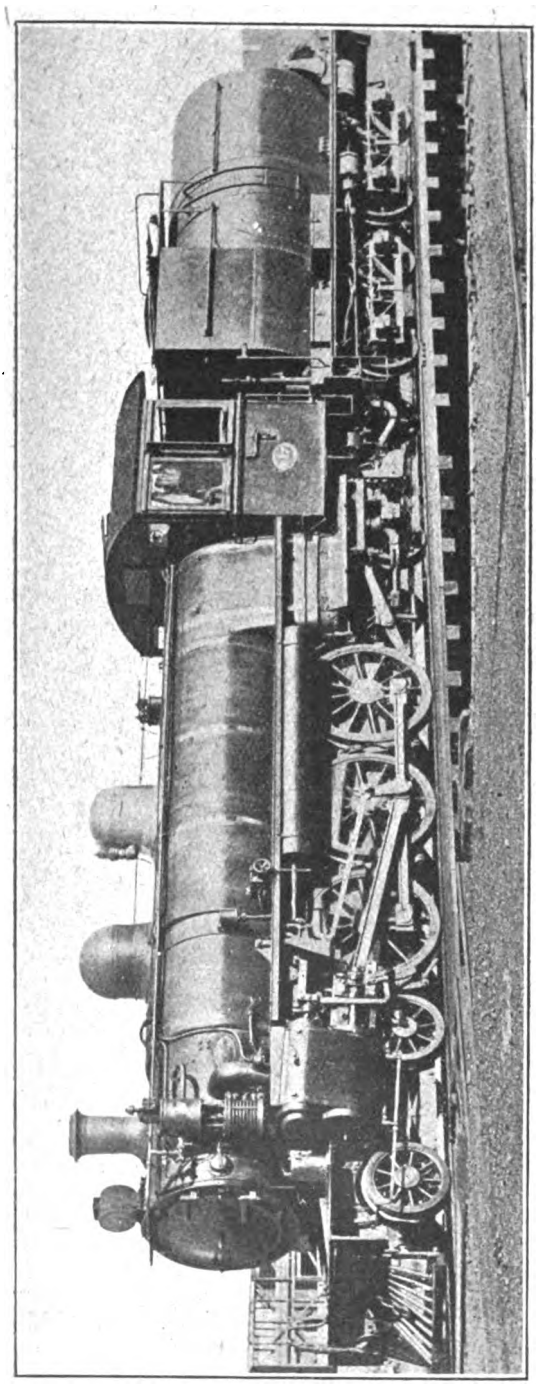
A Notable New Zealand Locomotive.



BY the courtesy of Mr. William Stewart, Mount Eden, Auckland, New Zealand, we are able to illustrate an engine that contains the later developments in locomotive practice and goes to show what fine machines a small oversea country like New Zealand can build.

The dimensions and remarks furnished by Mr. Stewart are as follows :—

New Zealand Government Railways, class Ab, built at Government Railway Workshops, Addington (South Island). Cylinders, 17 in. by 26 in.; diameter of coupled wheels, 4 ft. 6 in.; steam pressure, 180 lbs. per sq. in.; tractive power, 20,000 lbs.; fitted with Robinson superheater and the Wakefield mechanical lubricator. The tender, which is of the Vanderbilt type, holds 3,500 gallons of water and 5 tons of coal.

These engines were designed by Mr. H. H. Jackson, Chief Mechanical Engineer. They were first put to work on the level country between Christchurch and Oamaru, and they worked so satisfactory on this section that they were tested on hilly country between Dunedin and Oamaru, where they worked with the same result. Later they sent some to the North Island, between Wellington and Taumaruni, also between Ohakeine and Auckland, where they ran with splendid results. They have proved superior to the class A engines, and their large tender enables them to go greater distances without stopping to take water, and right through in their work and running they reflect great credit on Mr. Jackson, their designer.

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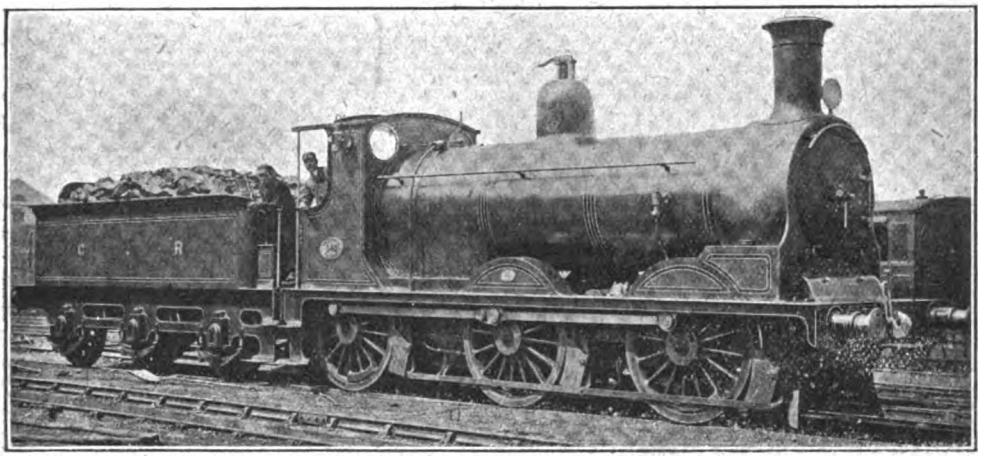
Locomotive and Train Working in the latter part of the 19th Century.

CALEDONIAN RAILWAY. [No. IV.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

FROM the date of Mr. John F. McIntosh's succession to the post of Chief Locomotive Engineer in 1895 it is to the credit of the company and that engineer that the Caledonian took the lead in the matter of British express locomotives, and the large modern boilers may be said to owe their inception to Mr. McIntosh. The twenty years' period 1875 to 1895 had seen very little change in the size of the locomotive boilers designed in Great Britain. On most lines for express engines with 18 in. by 26 in. cylinders the total heating surface was about 1,180 to 1,250 sq. ft., of which the firebox provided an average of 110 sq. ft. Amongst these were the Caledonian express engines of the Drummond and Lambie designs. Other railways, notably those over the locomotive departments of which the brothers Stirling presided, had boilers of which the heating surfaces were considerably less than the above. On the other side there were engineers who had increased the size of their boilers. Mr. Webb in his London and North Western compound engines ("Dreadnought" and "Teutonic" classes) used a boiler having 1,401 sq. ft. of heating surface. But this must be discounted to some extent since the enormous firebox surface of 159 sq. ft. owed this to the existence of a water grate, of which the heating surface was comparatively useless. The boilers also seemed to have too many tubes (225 $1\frac{7}{8}$ in. diameter) packed within a barrel only 4 ft. 1 in. inside diameter. Mr. Dean's boilers on the Great Western may be said to have had defects in the same direction, and in his 7 ft. 8 in. singles there were 266 $1\frac{3}{4}$ in. tubes crowded into a barrel of a mean diameter of 4 ft. $2\frac{1}{8}$ in., whereby a total heating surface (including 127 sq. ft. from the firebox) of 1,561 sq. ft. was attained. The Great Western goods engine boilers were, from the nature of the engines, and greater room for the boilers, much better, and contained 262 $1\frac{3}{4}$ in. tubes in a barrel of a mean internal diameter of 4 ft. $4\frac{1}{8}$ in., whereby a total of 1,371 sq. ft. was



Photo] [*Locomotive Publishing Co., Ltd.*

DRUMMOND STANDARD GOODS ENGINE, NO. 340.

Wheels, 5 ft. Cylinders, 18 in. by 26 in.

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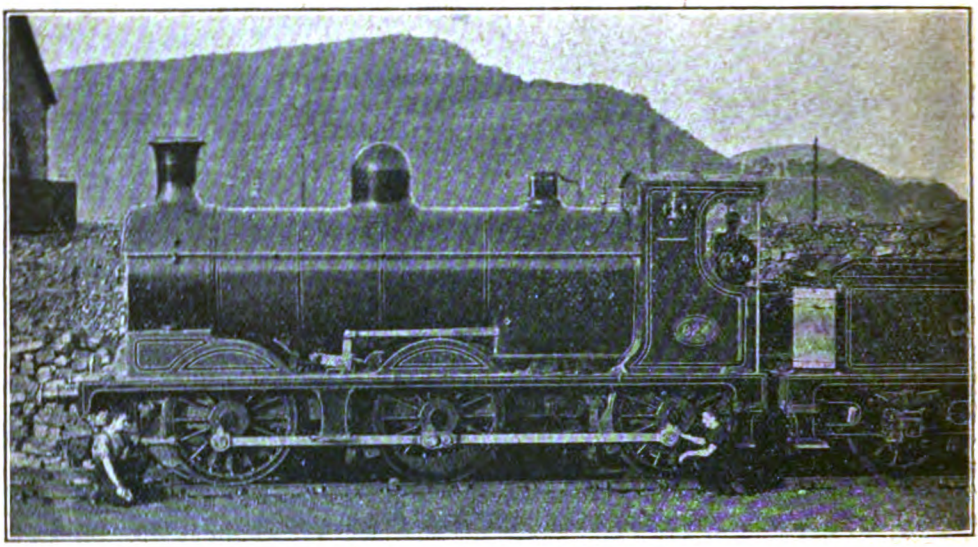

0–6–0 GOODS ENGINE, NO. 824.
Designed by Mr. McIntosh. Built at St. Rollox. Wheels, 5 ft. Cylinders, 18½ in. by 26 in.

secured. These Swindon boilers of 1889–1895 were probably the best in the country in the matter of heating surface. But hitherto no engineer had—on the standard gauge—taken the bold step of increasing the diameter of the boiler to such an extent as would provide sufficient room without overcrowding the tubes, until Mr. McIntosh tackled the question. In justice to some of the other locomotive engineers it must, however, not be forgotten that such an increase in the boiler dimensions adds considerably to the weight of the engine, and there were rigid limits beyond which they could not go, however much they might have liked to do so. But the gradual increase in the weight of the rails and the strengthening of bridges made that possible in 1895 which could not be done in 1885. Before that time there was always the veto of the permanent way engineer. If anybody wanted to study the proverbial effect of an irresistible force on an immovable object, an argument between the chief locomotive engineer and the chief civil engineer of a large railway would have provided him with at least some sort of an answer.

Mr. McIntosh, however, found himself in the happy position of being able to improve matters, and the result was the appearance of the justly celebrated "Dunalastair" class of express engines. In these Mr. McIntosh took the excellent Drummond 4–4–0 engine which had done such good work, and gave it a much larger boiler and 18½ in. cylinders instead of the 18 in. previous standard. The wheelbase was increased only by the small amount of 1 in. in order to accommodate the firebox. The boiler barrel has a mean diameter of 4 ft. 8⅛ in. and contains 265 1¾ in. tubes. The total heating surface is 1,403 sq. ft., of which the firebox provides 118¾ sq. ft. The pressure was increased to 160 lbs. and the total weight in working order to 47 tons.

The "Dunalastair," the first engine, is No. 721, and the remainder of the class are 722 to 735.* The boiler, which was pitched 7 ft. 9 in. from centre line to rail level, as compared with 7 ft. 3 in. in engines Nos. 13 to 18 of 1894, bulged out over the tops of the driving splashers, and gave the engines a particularly sturdy and imposing appearance. The tenders are six-wheeled and carry 3,750 gallons of water. The new engines were put on to the heaviest trains between Glasgow and Carlisle and Perth and Carlisle, and before completing her trial trips No. 721 had run three consecutive miles at 73·8, 76·3, and 79·0 m.p.h. respectively. Speed capacity as well as hauling power was now very essential, for the Caledonian trains had by this time become the fastest timed in the kingdom, with two runs booked at 60·9, and others at 56·8, 56·6, 56·4 and 55·7 m.p.h. over one of the hardest roads in the country.

* At the time of the 1897 Jubilee, No. 723 was named *Victoria* and 724 *Jubilee*. These names were ultimately removed.

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Amongst the many examples of their superb work I select the following from Mr. Rous Martin's report to the International Railway Congress. The load was 170 tons :—

Miles.			H. M. S.	
—	Carlisle ..	dep.	2. 0. 0	
13	Kirkpatrick	pass	2.13.29	
25¾	Lockerbie ..	,,	2.25.50	
39¾	Beattock ..	,,	2.37.41	
49¾	Summit ..	,,	2.52.48	
63¼	Lamington	,,	3. 3.59	
68¼	Thankerton	,,	3. 8.18	
73¼	Carstairs ..	,,	3.12. 1	
84	Law Junction	,,	3.22.50	slack
94	Coatbridge	,,	3.32.50	
109¼	Larbert ..	,,	3.47.59	
117¾	Stirling ..	arr.	3.55.28	
		dep.	3.59. 2	
122¾	Dunblane ..	pass	4. 6.43	
125¼	Kinbuck ..	,,	4.10.19	
134¾	Crieff ..	,,	4.20.14	
141¼	Dunning ..	,,	4.25.29	
150¾	Perth ..	arr.	4.33.46	

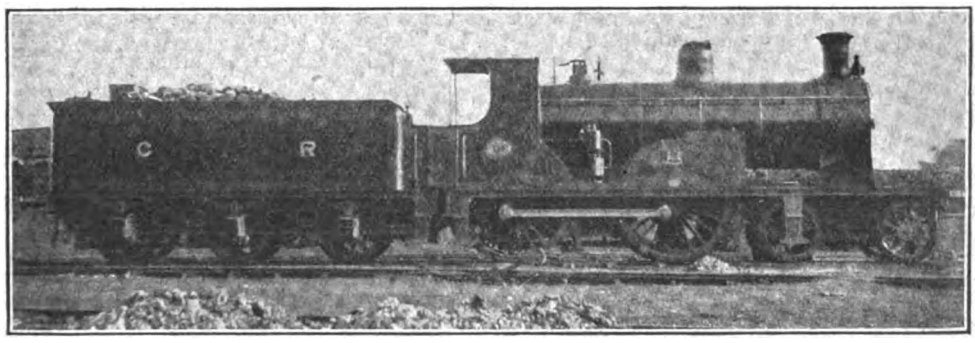
The following is the analysis of the above :

				Miles.	m.p.h.
Carlisle	start	to Lockerbie	pass	25¾	59·8
,,	,,	to Beattock	,,	39¾	63·3
Beattock	pass	to Summit	,,	10	39·8
Summit	,,	to Carstairs	,,	23¾	74·3
Carstairs	,,	to Stirling	arr.	44¼	61·1
Carlisle	start	to ,,	,,	117¾	61·2
Stirling	,,	to Perth	,,	33¼	57·4

Between Perth and Aberdeen (89¾ miles) the special Postal express was run on two occasions by these engines in 88 and 87 min. respectively, or at average speeds of 61·3 and 62 m.p.h.

At the end of 1897 Mr. McIntosh went one better, and produced a still larger class of engine which was at first known as the "Breadalbane" class from the name of No. 779. But for some mysterious reason the first of these new engines, No. 766, was shortly afterwards named *Dunalastair 2nd*, a very curious method of locomotive nomenclature, somewhat reminiscent of the Smith minor and Smith major of our public school days. And when a still later variation of these fine engines appeared in 1899–1900 they were described in the engineering papers as *Dunalastair III.*, though I do not think that matters progressed quite as far as to have this name on one of the engines. The "Breadalbanes" or 766 class consisted of 15 engines, Nos. 766 to 780, in which the size of cylinders was increased to 19 in. by 26 in., the driving wheels remaining 6 ft. 6 in. as before. The wheelbase from the centre of the bogie to the driving axle was increased by 1 ft., and a longer boiler barrel obtained, so that the total heating surface was augmented to 1,500 sq. ft., the firebox providing 118¾ sq. ft. as in the 721 class. The boiler pressure was increased to 175 lbs. The Drummond style of sandbox which formed a portion of the splashers was discarded in the 766 class, and the sandboxes were placed underneath the platform to enable the driver to have easier access to the big-ends and motion. The tenders of the 766 and subsequent class are carried on two four-wheeled bogies and hold 4,125 gallons of water. It is an open question whether these large tenders are a paying proposition. They weigh 45 tons, and mean that so much more dead weight has to be hauled over the country. But when water troughs are non-existent, and the general manager insists on long non-stop runs, the large tender is a necessity. When the Midland had got to this stage and copied the Caledonian bogie tenders, they made a plunge and put down water troughs at various necessary spots, after doing which they promptly scrapped the bogie tenders, or "water carts" as the men always called them.

However, to return from this digression to the Caledonian engines. The 766 class weighed 49 tons, of which 33¼ tons rested on the coupled wheels.



4–4–0 "DUNALASTAIR" CLASS ENGINE, NO. 724.
Designed by Mr. McIntosh. Built at St. Rollox, 1896. Wheels, 6 ft. 6 in. Cylinders, 18½ in. by 26 in.

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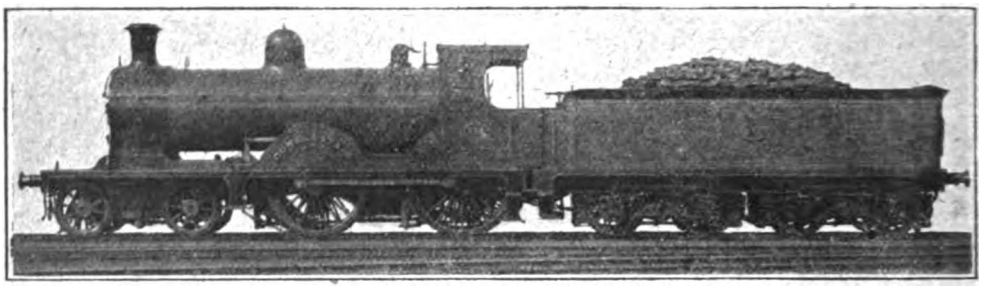

"DUNALASTAIR II." CLASS ENGINE, NO. 766 (SERIES 766–780).
Designed by Mr. McIntosh. Built at St. Rollox, 1898. Wheels, 6 ft. 6 in. Cylinders, 19 in. by 26 in.

The next engines or "Dunalastair III." class—preferably the 900 class—were still larger. The cylinders remained 19 in. by 26 in., but the coupled wheelbase was increased from 9 ft. to 9 ft. 6 in. to accommodate a longer firebox. The number of tubes, which had been 265 in both the 721 and 766 classes, was slightly increased to 269, and the total heating surface to 1,540 sq. ft., of which the firebox supplied 138 sq. ft. The boiler pressure was increased to 180 lbs. and the total weight of engine in working order to 51 tons 14 cwt. These new engines were built at St. Rollox in 1899–1900 and numbered 887 to 902. Further developments have taken place in these fine engines since the beginning of this present century, but they do not enter into my present narrative.

It may, however, be of interest to mention that in 1898 the locomotive authorities of the Belgian State Railways were so much impressed by the fine work done by Mr. McIntosh's Caledonian engines that they ordered five engines similar to the 766 class to be built by Messrs. Neilson and Co. As a result of the performances of these five engines, an additional 90 were put to work from the shops of various Belgian makers. These engines are known in Belgium as Type 17, and when Mr. McIntosh enlarged the design, the Belgian authorities followed suit and constructed 140 more of the enlarged class known by them as Type 18. Of the 230 "Dunalastairs," or rather "Breadalbanes," that were in service in Belgium before the war, how many will be left after the Boche thieves have committed their "Kultured" depredations?

I think the year 1896 saw the high-water mark of Caledonian booked speeds during last century, for in 1898 a few of the best trains had been eased down, not, I hasten to explain, for the reason that they could not or did not keep time, but because there was a general "letting out" of expresses all round on competitive routes. And then the train timing enthusiasts began to look somewhat gloomy; but on the other hand, the main line mile-posts which were showing signs of wear owing to such constant use, began to sprout and put on quite a spring-like appearance. Returning, however, to 1896, there are two or three trains that merit special mention. The first was the 1.54 a.m. "Tourist" express from Carlisle, which with a load varying from 140 to 170 tons was booked to Stirling, 117¾ miles in 125 min. This would have been an excellent performance over a level road, but when about 1,000 ft. to Beattock had to be climbed, it was nothing less than wonderful. Between Stirling and Perth—33 miles—the allowance was only 35 min., and finally the 32½ miles from Perth to Forfar, with load reduced to about 110 tons, was allowed only 32 min., or an average speed of nearly 61 m.p.h.

The "Postal Special" with 140 tons was timed between Stirling and Perth in 35 min. like the "Tourist," but had a much better timing to Aberdeen, the booked speed from Perth, 89¾ miles, being 97 min., or an average of 55½ m.p.h.

Then there was the 2.0 p.m. up "Diner" from Glasgow to Carlisle, which loaded about 320 tons during the summer and about 260 to 265 tons in the winter. This heavy train was not booked at the very high speeds of the trains mentioned above, the time to Carlisle being 135 min. for the 102¼ miles. With this train it was, however, usual to take a pilot from Glasgow up the bank to Carstairs, where a stop of about 1½ min. was made to detach. From Carstairs the train engine took the heavy load on alone to Carlisle in spite of the remaining climb of 23¾ miles to the summit.

In conclusion, a few examples of engine performances may be cited. On the down "Tourist," with the 117¾ miles run from

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Carlisle to Stirling, Mr. Rous Marten recorded the following phenomenal runs with engines of the "Dunalastair" (721) class :—

Miles.	Time. M. S.	Speed.	Load, tons.
117¾	115.28	61·2	140
117¾	116.53	60·45	161
117¾	117.40	60·0	170

One of the "Breadalbanes" (766 class) took a load of 331 tons net from Glasgow to Symington (signal stop), 35 miles uphill, much of it being 1 in 100, in 54½ min. and then ran from Symington to Carlisle, 67 miles start to stop, in 74 min. 55 sec., in spite of a 17-mile climb at the outset, up which the speed never fell below 31 m.p.h., although a strong side gale was blowing, with drizzling showers.

One of the 900 class with 180 lbs. pressure, pulling a load of 305 tons, ran from Strawfrank Junction (start) to Carlisle, 73½ miles, of which the first 23¾ miles are on a rising gradient, the last 2 miles at 1 in 100, in 75 min. 56 sec. The minimum speed up the 1 in 100 rise was 36 m.p.h.

The following instance is given of an average daily run in 1899 of the heavy 2.0 p.m. "Diner" from Glasgow. The load was three 40-ton dining cars and six eight-wheeled coaches, say approximately 265 tons empty. The engine, No. 767, one of the "Breadalbanes," was piloted from Glasgow to Carstairs by No. 479, one of the 6 ft. 2 in. 2–4–0 express goods engines rebuilt in 1885 by Mr. Drummond. The run up the bank to Carstairs was done at a very moderate pace, the 28½ miles taking 46 min. 20 sec., or an average speed of only 36·7 m.p.h. After a stop of 1½ min. to detach No. 479, the train was taken on by 767 unaided.

Miles.			H. M. S.	M.P.H.	
73½	Carstairs	dep.	2.47.55	—	
	post 72	pass	2.51.43	—	
	,, 71	,,	2.53.27	34·6	1/150 up
	,, 70	,,	2.55.19	35·3	
	,, 69	,,	2.56.47	40·9	
	,, 68	,,	2.58.17	40·0	1/100 up
	Symington	,,	3. 0. 0	—	
	post 66	,,	3. 1.15	40·4	
	,, 65	,,	3. 2.34	45·6	1/200
	,, 64	,,	3. 3.40	54·5	down
	,, 63	,,	3. 4.43	57·1	level
	,, 62	,,	3. 5.46	57·1	
	,, 61	,,	3. 6.56	51·4	
	,, 60	,,	3. 8.11	48·0	
	,, 59	,,	3. 9.28	46·1	1/200 to 1/300 up
	,, 58	,,	3.10.48	45·0	
	,, 56	,,	3.13.25	45·6	
	,, 55	,,	3.14.45	45·0	1/240 up
	,, 54	,,	3.16.12	41·4	1/150 up
	,, 53	,,	3.17.42	40·0	
	Elvanfoot	,,	3.18.14	—	

Miles.			H. M. S.	M.P.H.	
	post 52	pass	3.18.59	41·4	
	,, 51	,,	3.20.23	42·8	1/100 up
	,, 50	,,	3.22. 4	35·5	
	,, 49	,,	3.23.38	38·3	Summit
	,, 48	,,	3.24.43	55·3	49¼ post
	,, 47	,,	3.25.43	60·0	
	,, 46	,,	3.26.39	64·3	1/75 down
	,, 45	,,	3.27.35	64·3	
	,, 44	,,	3.28.30	65·5	
	,, 43	,,	3.29.25	65·5	1/80 down
	,, 42	,,	3.30.20	65·5	
	,, 41	,,	3.31.17	63·1	
	,, 40	,,	3.32.17	60·0	1/88 down
	Beattock	,,	3.32.35	—	
	post 39	,,	3.33.18	59·0	
	,, 38	,,	3.34.15	63·1	average
	,, 37	,,	3.35.11	64·3	1/200
	,, 36	,,	3.36. 5	66·7	down
	,, 35	,,	3.36.58	67·9	
	,, 34	,,	3.37.55	63·1	level
	,, 33	,,	3.38.56	59·0	
	,, 32	,,	3.39.56	60·0	
	,, 31	,,	3.40.54	62·1	1/330,
	,, 30	,,	3.41.52	62·1	1/880 and
	,, 30	,,	3.41.52	62·1	1/528
	,, 29	,,	3.42.50	62·1	down
	,, 28	,,	3.43.50	60·0	
	,, 27	,,	3.44.53	57·1	
	,, 26	,,	3.45.57	56·2	Lockerbie,
	,, 25	,,	3.47. 4	53·7	25¾ miles
	,, 24	,,	3.48.11	53·7	1/200 up
	,, 23	,,	3.49.21	51·4	
	,, 21	,,	3.51.47	49·3	
	,, 20	,,	3.53.16	40·4	relaying
	,, 18	,,	3.55.43	49·3	slack, post
	,, 17	,,	3.56.46	57·1	20½
	,, 16	,,	3.57.50	56·2	
	,, 15	,,	3.58.56	54·5	
	,, 14	,,	4. 0. 5	52·1	
	,, 12	,,	4. 2. 6	59·5	
	,, 11	,,	4. 3. 2	64·3	
	,, 10	,,	4. 3.56	66·7	1/200 down
	,, 9	,,	4. 4.50	66·7	
	,, 8	,,	4. 5.43	67·9	
	,, 7	,,	4. 6.35	69·2	
	,, 6	,,	4. 7.30	65·5	
	,, 5	,,	4. 8.32	55·3	
	,, 4	,,	4. 9.36	56·2	
	,, 3	,,	4.10.42	54·5	
	,, 2	,,	4.11.48	54·5	
	,, 1	,,	4.12.59	—	
	Carlisle	arr.	4.14.35	—	

The above is given as an *average* example and does not show any maximum speed in excess of 69 m.p.h. From the 49¼ post to Carlisle the average was 57·2 m.p.h.; it could easily have been run at 67 m.p.h. if required, but the train was just within its time allowance. Perhaps the best portion from a locomotive point of view was the 41 m.p.h. average from the dead start at Carstairs to the summit of the bank.

But it may be added that on a previous occasion one of the much smaller Drummond 4–4–0 engines, No. 87, had with the same train and a much heavier load of 320 tons accomplished the wonderful feat of running from Carstairs to Carlisle in 81 min. 35 sec.

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The run from Symington to Carlisle—67 miles—having been covered in 72 min. 57 sec., or at a speed of 55 m.p.h.

The excellence of the modern Caledonian engines is, however, so well known that no further comment is required.

I have to thank two correspondents for kindly pointing out an error in the May number (page 298), in which I stated that on the last night of the 1895 race to Aberdeen the train stopped at Stirling and was taken thence to Aberdeen by the 7 ft. single engine No. 123. I was abroad during the period of the race, but received copies of some of the engineering and other papers in which the details appeared. The particulars given by me were taken from the account given in *The Engineer* of August 30th, 1895 (page 204) by the late Mr. Rous Marten. In the following issue of the same journal, a copy of which I did not receive, the same writer inserted a correction (page 239), in which he stated that the particulars of the supposed run by No. 123 were inserted on the strength of a telegram from Scotland which purported to convey official facts. The truth is that on the last day of the race the train was run from Carlisle to Perth, where it stopped, by No. 90, the 6 ft. 6 in. coupled engine driven by A. Crooks. It left Carlisle at 12.38½ a.m. (another conflicting account says 12.37½ a.m.) and reached Perth at 3.7½ a.m., according to both accounts. From Perth to Aberdeen the engine was No. 17, driven by John Soutar, and the train left Perth at 3.9½ a.m., arriving at Aberdeen ticket platform at 4.30 a.m. I must therefore express my regret to the readers of the RAILWAY MAGAZINE for having inadvertently perpetuated the original error which appeared in the engineering press at the time.

(*Concluded.*)

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE 19TH CENTURY.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—
L. & N.W.: Jan., Feb., March, May, 1915. (All out of print except May.)
Great Northern: June, July, 1915. (Out of print.)
M.S. & L.: Aug., Sept., Oct., 1915. (Aug. out of print.) (and Feb. out of print.)
Great Western: Nov., Dec., 1915. Jan., Feb., March, April, May, June, July, Aug., 1916. (Jan.
Glasgow & S.W.: Sept., Oct., 1916.
North Eastern: Nov., Dec., 1916; Jan., Feb., March, April, May, 1917. (Jan. out of print.)
South Eastern: June, July, Aug., 1917.
Lancashire and Yorkshire Railway: Sept., Oct., Nov., 1917.
London, Chatham and Dover Railway: Dec., 1917; Jan., Feb., 1918.
Caledonian Railway: March, April, May, June, 1918.

In July, 1918, Mr. Ahrons will deal with the Great Eastern Railway.

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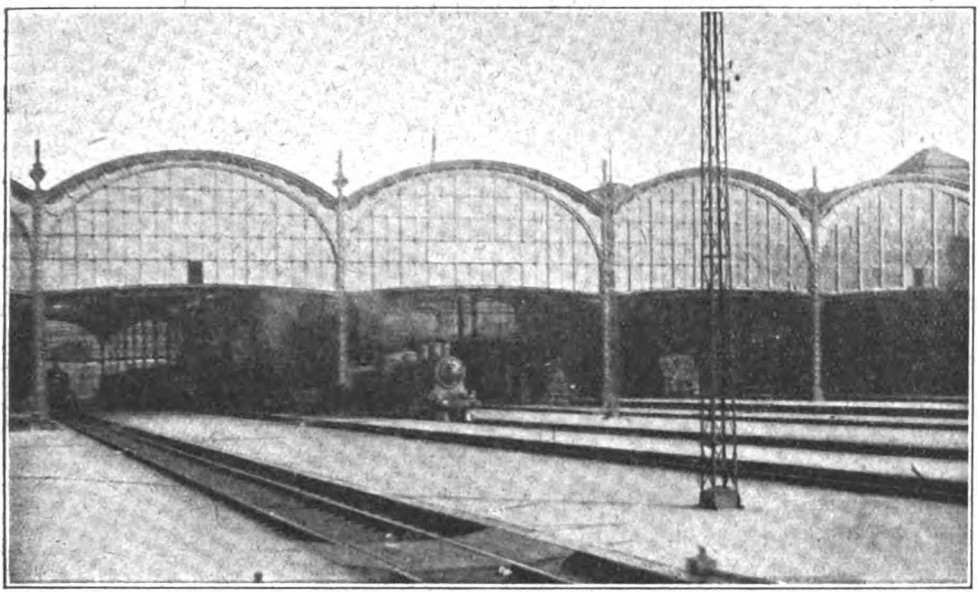

BASLE RAILWAY STATION.
South view.

North to South, *via* Switzerland.

By EDWIN J. MILLER.

BY far the most important route between North-western Europe and Italy *viâ* Switzerland is that of the St. Gothard, which was also the first to be opened. It is proposed to describe the journey from Basle to Milan, *viâ* Lucerne and Bellinzona. Basle station has already formed the subject of an article in the RAILWAY MAGAZINE for April, 1906, but in order to appreciate the international traffic conveyed over the Swiss railways, some small description of the traffic of the station is desirable. In point of the number of departures dealt with here, Basle takes third place on the Swiss Federal Railways with a total of 1,846,476 passengers for 1911, the last period for which details are available. Unlike Zurich and Lausanne, which deal with more travellers, except for a few "Trains de Luxe," practically all trains terminate their journeys at Basle, necessitating a change—and the incidental Customs inspection—as this is a frontier station. The train arrivals and departures during the summer period of 1914 numbered 247 (Swiss 151, German 96), but are not evenly distributed throughout the 24 hours.

They are dealt with in groups, departures of Swiss trains being in connection with arrivals of the services from French, German, etc., points. For our purpose it will be sufficient to cite an example :—The following table of trains are those of pre-war days in connection with the service from London *viâ* Boulogne at 2.5 p.m., and from Paris and Berlin during the evening hours of the same day. Corresponding groups are coincident upon London departures at 9.0 p.m. *viâ* Calais and Ostend, these arriving at different hours.

In the opposite direction of travel much the same procedure is to be observed.

BASLE (SWISS STATION) ARRIVAL OF FRENCH AND GERMAN TRAINS AND SWISS DEPARTURES.

	a.m.				a.m.	
(1) Paris	5.30				6.50	Zurich
(2) Ostend	5.43				7.0	,,
(3) Berlin	6.01				7.05	Gothard
(4) Boulogne	6.07	Arrivals	.. ..	Departures	7.15	,,
Frankfort	6.18*				7.20	Zurich
Cologne	6.24				7.28	Gothard
Boulogne	6.34				7.40	,,

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This shows the point of origin and destination of the trains which—except for certain through carriages—do not run through the station at Basle. * This train arrives *viâ* the Baden Railway, others *viâ* Alsace-Lorraine system.

A word as to the "make-up" of our train, the through coaches of which are numbered as above in the following marshalling of the 7.05 a.m. *ex*-Basle to Chiasso, the Swiss frontier point *en route* to Milan during the summer of 1914 :—

Railway.	Carriage.	Tons.	
II.	F 3	19	
II.	B 3	24	Basle-Lucerne*
III.	AB 3	24	
(4) Eastern (France)	AB 4	35	Boulogne-Lucerne*
(1) „ „	AB 4	35	Paris-Milan
(2) Belgian (State)	AB 4	37	Ostend-Genoa†
	International Sleeping Car Co. Restaurant.	34	Basle-Milan
(3) Prussian State	AB 4	41	Berlin-Milan
V.	AB 4	35	Basle-Milan
V.	FZ 4	32	„
		316	

Load : Basle-Lucerne, 316 tons ; Lucerne-Milan, 214 tons.
* Off at Lucerne.
II., V. Second, Fifth, etc., division of Swiss Federal Railways.
AB Composite 1st and 2nd class.
F Luggage van.
FZ Mail and luggage van.
3, 4 Number of axles.
† This vehicle is, at certain periods, replaced by a similar one of the Italian State Railways, to balance mileage arrangements.

No stops for passenger service are made before we reach Olten, 23 odd miles, but in order to attach and detach a banking engine, two service stops are made. As far as Sissach the gradients are about 1 in 120, the last mile or so 1 in 100. From here to Laufelfingen, 6 miles, the rise is continued at 1 in 48, and then a descent of 5¼ miles at 1 in 38 to Olten, the latter proving a stiff obstacle to trains going north, two banking engines often being employed. The load for the six-coupled engines with leading bogie and eight-wheeled tender is 325 tons to Sissach, and 200 beyond—hence the employment of a banker, which is normally an articulated tank of 0-4-4-0 type. Just after leaving Basle, the line is joined by one (serving the goods station) at the Birs-Bridge, which is a block station, and the train travels to Pratteln, 5·1 miles, *viâ* the same route as those to Zurich—this stretch of line being the busiest in Switzerland, with about 190-200 trains daily running over it. The station has four platforms, the trains to Zurich diverging to the left before reaching it. Up to this point the rise is very small, but beyond, the gradient is marked. The train—with its banking engine—leaves Sissach at 7.30, and the journey to Olten is one of scenic interest, the line being built upon one of the slopes of the valley, and abounding in curves. From Laufelfingen—where the banker is detached (and runs down light to Olten in order to be employed in the opposite direction)—the train at once passes into the Hauenstein Tunnel (opened May, 1858), 1 mile 1,210 yards. So that the speed of the trains down the bank of 1 in 38 may be controlled, 6 electrical contacts are installed between each of which 3·3 minutes (equalling 31·1 m.p.h.) must be consumed. The last of these contacts is at the Olten-Tannwald signal station (below mentioned). The train is due at Olten at 7.57 a.m. From Sissach—above mentioned—there has been, since the outbreak of war, opened a new route to Olten, piercing the Hauenstein Mountain range by a new tunnel, 5 miles in length, called the *Base Tunnel*, affording gradients not greater than 1 in 100. This was opened during the winter of 1915-16, and has resulted in an acceleration of 10 min. in the journey times, but its obvious advantages will not be fully realised till normal conditions bring about the full train service. The junction of this line with the old takes place at a new block station called Olten-Tannwald, just one mile short of the station.

Olten is the most important junction station in Switzerland, dealing with some 308 trains of all descriptions daily. It is the point of intersection between the chief North-South and East-West lines, that from Zurich in Eastern Switzerland coming in on

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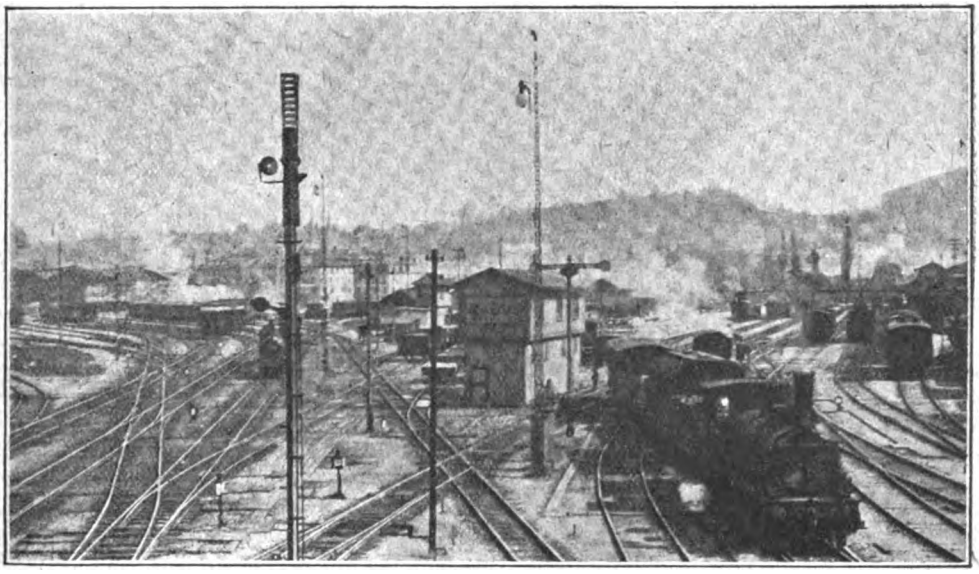
the left immediately before reaching the station. Olten has three big island platforms, and like most Swiss stations, each are served by a particular service of trains. The traffic—except for that of through nature—is very small, as the town itself is not one of great importance. From the railway point of view it forms a most important one, as besides the passenger traffic already noted there is a very large marshalling yard, the locomotive sheds for the district and the chief railway repair works for the second division; the latter employing over 800 men. The sheds accommodate over 50 engines, of which some 35 are required to form the links, six of these being used for banking, etc., purposes.

company to withdraw from these local services, the Swiss Parliament instituted a yearly tax equal to 15 per cent. of the entire capital. This speedily brought about the desired end, and to supply the routes thus vacated the Swiss Restaurant Car Co. was formed. *En passant*, it may be said that better meals are now to be obtained at less cost, but the cars for the through services are still run by the International Sleeping and Restaurant Car Co..

Olten is left at 8.1 a.m., and the next stop is that of Lucerne at 8.58. The gradients as far as Rothenburg, 28 miles, are rising at inclinations between 1 in 200, and 1 in 100. To Emmenbrucke (3½ miles); the gradient descends at 1 in 62, accompanied by severe



LUCERNE RAILWAY YARDS.
Passenger station on the left.

Olten is also the headquarters of the recently-formed Swiss Restaurant Car Co.; the inception of this company is worthy of note. For many years the International Sleeping and Restaurant Car Co. performed all the services indicated by its title in Switzerland. Being constituted under foreign laws, both the capital and profits were outside the jurisdiction of the Swiss nation, a matter which caused some contention, the contracts made for the use of cars performing international services, *i.e.*, between Switzerland and one other country, could not be abrogated, but those of a local nature were different. In order to force the

reverse curves reaching Lucerne, 34·1 miles, from Olten over approximately level grades. In the reverse direction banking is regularly employed on the express trains to Rothenburg. Within the station limits of Olten a single line goes off to the left, being that to Lausanne, *viâ* Neuchatel. The first station we pass is Aarburg–Oftringen, one platform of which is constructed of wood, the track being roofed over, forming a link with the days of private operation. Just beyond here the most important route to Western Switzerland—*viâ* Berne—diverges to the right. This is a double track and conveys the majority of the traffic both

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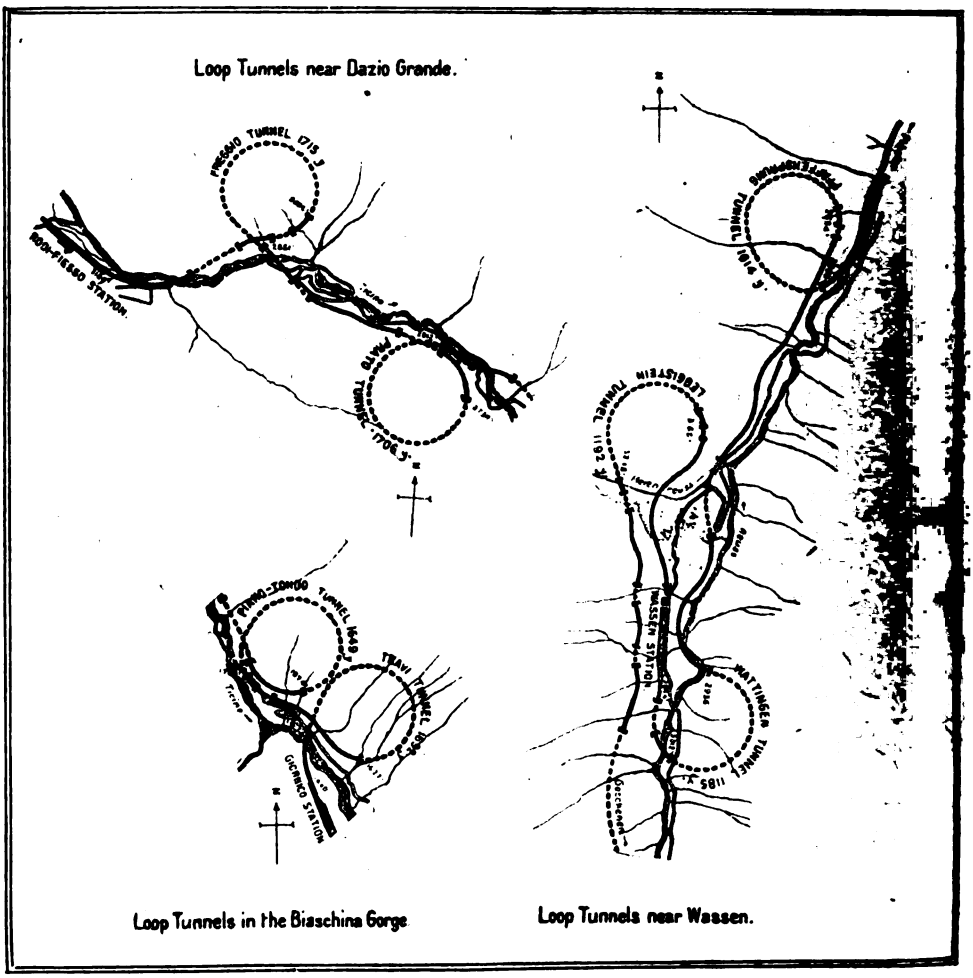
between Zurich and Basle and Berne, the last two mentioned places having an alternative route.

The next station of Zofingen is a junction for the Zurich line, a single line coming in on the left, over which a small passenger but important goods traffic is conveyed. Continuing our journey, we pass Nottwil at 8.35, the terminating point of the double line from Basle. From here to Lucerne the second track is being laid.

electrification running powers being exercised.

At the block post of Fluhmuhle near Lucerne a line from Berne joins our own on the right, while on the left a line from Zurich comes in, but without physical junction. At the second block station, that of Sentimatt, the St. Gothard line coming from the left forms a junction with the line that parallels our own, and the two run side by side to Lucerne.



At the next station, Sempach-Neuenkirch, a passenger train is crossed at 8.40, and passing Rothenburg, already mentioned, Emmenbrucke and two intermediate block stations, we reach Lucerne, the terminus of the second division of the Swiss Federal Railways.

At Emmenbrucke an electric line from the Lake Valley comes in, the coaches being steam-hauled into Lucerne, previous to the

It seems unusual that connections are not installed here and the two (single) tracks operated as a section of double line, but this curious working serves its purpose very well, as the majority of trains usually run to schedule.

The picture of the yard at Lucerne shows in the left-hand corner three of the four roof spans, the station having 9 platforms and 10 tracks. It is of the terminal type, and

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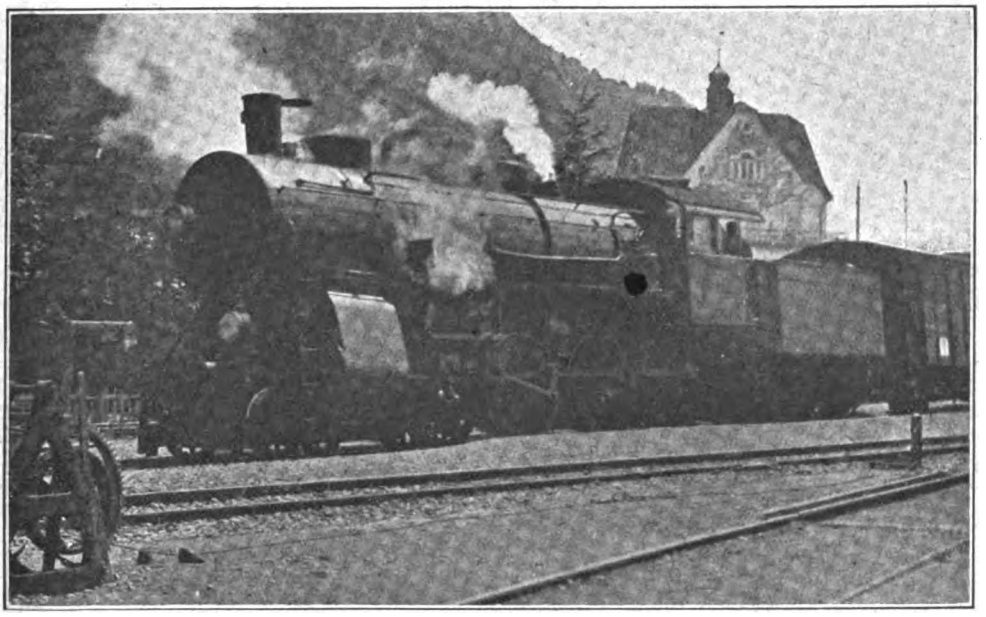
receives on the left, facing outwards, the metre gauge track of the Brunig, which fouls all the lines leading to the goods yard. The station is controlled by a signal box of somewhat British pattern, containing about 80 levers. Lucerne is the head station of the fifth division of the Swiss Federal Railways, formerly in its entirety the St. Gothard Railway, the working of which was taken over on May 1st, 1909. Some 160 passenger and 30 goods trains arrive and depart daily, but the movement of passengers is relatively much greater on account of the popularity of this resort, the departures numbering 994,441 during 1911.

Lucerne being the chief point *en route*, it is convenient to take a retrospect of the general aspect of the train services over the St. Gothard route. The line as far as Lucerne was opened in 1858, the best train taking 4 hrs. 25 min., including an omnibus journey from Emmenbrucke, the railway into Lucerne not being then opened, this taking place the following year.

Although portions of the St. Gothard route were opened in 1874, the opening throughout from Lucerne to Milan was not completed until 1882, and all the services at that date entailed a wait of some hours at one of the stations *en route*, bringing the time of the journey (Lucerne–Milan) to at least 23 hours. The train in which we shall continue the journey accomplishes the trip in 5 hrs. 57 min., this being the fastest communication between the two cities. The 9.8 a.m. from Lucerne was put on in 1898 as a first class only train, and some years later second class accommodation was added. The time of its departure and the number of carriages have not altered to the date under review, and its arrival at Milan expedited only by 4 min. Whilst no apparent progress has been made in this direction, it must be remembered that the weight of the coaches has continuously increased, rendering acceleration difficult in view of the specially heavy gradients. In place of 6 daily trains at the opening, there are now 26 services, 18 of which are of an express order.



SWISS LOCOMOTIVE OF 931–938 CLASS.

The St. Gothard Tunnel, from which the line takes its name, pierces the central buttress of the Alpine range, and was constructed in 1872–82 at a cost of over £2,270,000. It is situated between Goschenen and Airolo, its length being 16,393 yards (9¼ miles), and until the opening of the Simplon Tunnel, was the longest in the world. It is built for a double track, and is 28 ft. broad and 21 ft. high. Altogether the line has 80 tunnels (of an aggregate length of 28½ miles) and 324 bridges of more than 32 ft. span, besides many smaller ones.

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Apart from its scenic attractions, the St. Gothard Railway has a unique series of engineering triumphs, which will be described in the course of the journey.

The engine and the four leading coaches of the train are detached and an engine of the fifth division attached at the rear. This is of the 4–6–0 type, having two high and two low pressure cylinders. They are fitted with Clench superheaters and have a working pressure of 220 lbs. per sq. in., the diameter of the coupled wheels is 5 ft. 3½ in., the total weight in working order 118¼ tons. This series of 8 engines is known as A3/5, and was built by the Swiss Locomotive Works of Winterthur and Maffei, of Munich, in 1907–8.

At 9·08 a.m. the train pulls out, and as far as the junction of Sentimatt traverses the single line already referred to. Here it diverges to the right on a sharp curve, crossing over the river Reuss, and enters the Musegg Tunnel, situated under the ancient walls of the town. Upon emerging, it will be seen that the train almost faces the station of Lucerne, only on the opposite side of the lake. Passing two intermediate stations, it crosses a narrow neck of land between Lakes Lucerne and Zug, to Immensee, where the double track again commences. This length of line (11·8 miles) was opened subsequently in order to shorten the distance. Previously all trains, and now only goods trains, used an alternative route from Olten, the goods trains on account of favourable gradients and to obviate the change of direction necessitated by running *viâ* Lucerne.

The next station, that of Arth-Goldau, is both the terminus for the aforesaid goods trains so far as they are handled by the second division, and the point of junction for Zurich and Eastern Switzerland reached *viâ* that town. This train is the only one not stopping there, but all the others do so to exchange through carriages from German and intermediate points. Owing to the extra traffic between Immensee and Arth-Goldau, two intermediate block posts are in operation, the only such stations on the line. Between these two stations the line skirts the base of the well-known Rigi Mountain, and on May 29th, 1906, between the times of two trains, a fall of rock, amounting to over 1,000 tons, completely blocked the line

Photo] [*Wehrli Freres, Kilchberg, Zurich.*

GIORNICO.

Looking south from the upper level of spiral tunnels.

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for about two weeks. Since that occasion special time-tables have been prepared for use in a similar emergency, the train service being operated by a line on the opposite side of Lake Zug, causing a delay of approximately 40 minutes.

The line from Zurich (situated at the north end of the lake of same name) comes in on the left by a trailing junction, the station being placed in the apex formed by the two lines. About 100 yards beyond, a facing junction on the same side of the line is formed by the Swiss South Eastern Railway, which by gradients as steep as 1 in 20 reaches the several towns at the southern end of Lake Zurich.

Continuing our journey from Arth-Goldau, which is passed at 9.37 a.m., the train as far as Brunnen, 7·2 miles, by descending gradients of 1 in 100, and then 1 in 120, skirts, though at a greater distance, the base of the Rigi, reaching the Lake of Lucerne at practically the same height above sea level as Lucerne.

From Brunnen to Fluelen, 7·5 miles, the train proceeds along the edge of the lake, which at this part is renowned for its rugged grandeur and made romantic by the exploits of the Swiss national hero, William Tell. The line between these two stations is single, and has ten tunnels driven through (in most cases) promontories formed by the mountain masses which, except at the village of Sisikon, a passing place, descends sheer into the lake. The two longest of these tunnels are respectively 2,148 and 1,224 yards. Fluelen is situated at the head of the Lake of Lucerne, and at the entrance to the St. Gothard Valley. We pass the station at 10.0 a.m. and again enter double track and by easy grades pass the succeeding one of Altdorf, arriving at Erstfeld at 10.08 a.m., our first stop, the 37·6 miles being traversed in the even hour.

Erstfeld is the site of the locomotive, etc. (small repair) shops, being the second most important on this division. Here in the engine sheds are stabled some 30 locomotives in daily working, about the same number as that of Bellinzona, to which reference will be made later, except to remark that at the latter station the traffic of two branch lines has also to be provided for, while at Erstfeld the majority of the locomotives are required to handle the train service upon the northern "ramp" of the approach to the St. Gothard Tunnel. While very little passenger traffic originates here, the village being in many senses a "railway" one, it is of special importance in connection with the piloting and (or) banking which occurs to all southward trains. The one in question primarily stops for the purpose of detaching the train engine which has completed its day's journey. It is replaced by two of similar class, one acting as pilot. On express trains 150 tons is the maximum allowed for one engine of the class illustrated; between here and Goschenen the eight-coupled locomotives can take 200 tons, but these are normally employed on goods, then taking up to 240 tons over the same line.

The distance from Erstfeld to Goschenen is just 18 miles, and departing at 10.12, we reach Goschenen at 11.1, the speed equalling exactly 22 m.p.h. The gradient throughout is between 1 in 38 to 1 in 39, and 21 tunnels and 16 bridges of over 60 ft. span, including the Kerstalen Bach, which spans a mountain torrent at a height of 190 ft., are passed *en route*. The scenic and engineering features are of the first order. The difference in height between the two stations is about 1,950 ft., and to overcome this, at the gradients already mentioned recourse has been made to three spiral tunnels. These occur between the 55th and 66th kilometre posts, which, together with their approaches, represent a rise of 720 ft.

The first of these spiral tunnels is at kilometre 55, and in a length of 1,614 yards the line rises 115 ft. Continuing up the valley, we pass—for the first time—the little church of Wassen, entering at kilometre 59·5 the second tunnel. In this we reverse our direction, the train now travelling towards the north. In the 1,185 yards the line rises 76 ft. Wassen station is now passed, and a moment afterwards the church, for the second time, while we can see below us, about 150 ft., the line we have already travelled over. At kilometre 64·7 we enter the last spiral tunnel, 1,192 yards in length, rising therein 82 ft.

On emerging we see upon our left the two lower levels, and for the last time the village church, being now over 350 ft. above the lowest of the three levels. Besides these three notable tunnels, many smaller are traversed, as well as the two river Reuss bridges which are situated at the extremities of the middle spiral tunnel. A few minutes after leaving the environs of Wassen station we reach Goschenen, where the pilot engine is detached. This station is, for tourist purposes, perhaps the most interesting *en route*, as being the point of departure for many alpine journeys. At the suitable hours

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all trains without restaurant accommodation stop 20 min. in order that passengers can avail themselves of the large refreshment rooms in operation.

From here, too, the diligences start for their journeys, and the station during the stoppage of a train presents an interesting state of animation. The banking or piloting engines detached here from trains running south usually return light to Erstfeld, while for north-bound trains the engine is detached at Airolo, at the other end of the St. Gothard Tunnel. A minute after our departure at 11.5 a.m. we enter the St. Gothard Tunnel. In this the gradient rises at 1 in 166 for about two-thirds of its length, thence descending at 1 in 500 to the exit at Airolo, where we stop at 11.23. So that the drivers can ascertain their position, numbered lanterns are placed alternately on each side of the tunnel at intervals of 1,000 metres, and from these points communication can be made with the stations at either end. The central point is 3,786 ft. above sea level, and except for a slight curve at the southern entrance it is quite straight.

In the little cemetery at Goschenen is a monument to Louis Favre, the engineer of the tunnel, who died here July 19th, 1879, a few months before its completion.

On emerging from the tunnel at Airolo, the lover of nature will see a very great change in the landscape, the scenery although alpine for some 30 miles beyond, has the soft aspect which the mountain barrier gives to it. Often when it is raining or snowing at Goschenen, across the pass in the Valley of Airolo the sun is shining brightly. Here, too, a different language, Italian, instead of German, greets the ear. For instance, Bahnhof and Restaurant become respectively Stazione and Ristorante. However, except for the use of the Italian language by the employees, the general organisation and working of the railway remains unchanged.

As the stretch of line between Erstfeld and Goschenen is described as the mountain grade, so is the line between Airolo and Biasca similarly called, though for our train journey it is all descending. As far as Rodi-Fiesso (7·1 miles) the gradient is at 1 in 40 and to Giornico (13·6 miles) at 1 in 38, followed by a further descent of 3·1 miles at 1 in 37, reaching Biasca, 28 miles from Airolo by an easier descent at 1 in 66. It will thus be seen that the southern "ramp" is some 10½ miles longer than that of the northern, with, for the most part, more difficult gradients. Leaving Airolo at 11.24 a.m., we pass over the Stalvedro Bridge which spans the Ticino, a stream which, like the Reuss, we shall cross and recross a number of times. The station of Rodi-Fiesso is passed at 11.36, and we enter the first of the two series of spiral tunnels built to ease the gradients on this side of the St. Gothard Tunnel. This, the Freggio Tunnel, is 1,715 yards in length, and descends 138 ft. A minute or two afterwards we traverse the second (Prado) tunnel, 1,706 yards long, descending therein 118 ft., and crossing the river for the fourth time. This tunnel is practically circular, its exit and entrances being almost coincident, except for the difference in elevation. Passing Faido, the capital of the Leventina (the Ticino Valley), and Lavorgo, we reach the second series of spiral tunnels, the first of these two (Piano-Tondo) 1,649 yards in length; we descend 139 ft., and in about 800 yards enter the second or Travi Tunnel, 1692 yards long, descending 122 ft., and reach Giornico station, which is passed at 11.58. The total descent made by the four spiral tunnels and the connecting piece of line is 1,522 ft.

It is not within the photographer's power to portray completely any of the spiral tunnels, but the view on page 374, together with the plan, will give an idea of their constitution and the nature of the country traversed.

Between here and the next station of Bodio we cross the Ticino for the tenth and last time, and at 12.9 pass Biasca, an important locomotive depôt. The engines employed on the southern "ramp" are shedded here and also at Bellinzona, 12 miles distant. The Bellinzona sheds also accommodate the necessary locomotives to work the southern sections of the line, and there some 30 regular workings are provided for. From Biasca the gradients continue to descend at 1 in 120, and 240 to Bellinzona, at which the train halts at 12.25 p.m. From Bodio, already referred to, the valley expands, and luxuriant vines, walnuts, etc., indicate the southern regions to which the train proceeds. Bellinzona, 760 ft. above the sea level, is the chief town of Italian-speaking Switzerland. It is the junction for the Locarno and Pino branches, the trains of these branches using the main line as far as Giubiasco.

Bellinzona is also the site of the chief workshops for the fifth division, at which a small amount of wagon stock is built, heavy repairs being undertaken for all classes of

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rolling stock, employing, as the third largest in Switzerland, over 600 men. Here the old St. Gothard Co. established schools for the benefit of the employees and their children resident in the neighbouring hamlets and where educational facilities were few, certain of the trains being run at hours convenient for school purposes.

Double track extends to the next station, Giubiasco, on a descending gradient of 1 in 100, this section of line on account of the afore-mentioned branches having a fairly considerable traffic. From here to the station of Rivera (7 miles) is an ascending gradient of 1 in 38, followed by 9·4 miles downhill at gradients of 1 in 45 to 1 in 71 to Lugano, 18·4 miles from Bellinzona. We stop 5 min. at Bellinzona, and passing Giubiasco and taking a sharp curve to the left, commence the ascent of the Mount Ceneri. Before reaching Rivera station we pass the Ceneri Tunnel, 1,830 yards in length. During the ascent fine views are to be enjoyed of Locarno and the influx of the Ticino into Lake Maggiore, some 750 ft. below our vantage point.

At Rivera the pilot-engine attached at Bellinzona (usually of the same class as the train engine) is detached, the stop being for service purposes only, and in addition an opposing train is crossed. The train descends through a gloomy valley and passing through the Massagno Tunnel, 1,016 yards long, to Lugano, arriving at 1.14 p.m. From the station buildings beautiful views are obtained of the town and lake, the scenery of which is Italian in character. Leaving again in 4 min., the train crosses the Tassino Valley by means of a viaduct 130 ft. high, and threading the Paradiso Tunnel (810 yards), reaches the level of the lake at Melide (gradients 1 in 58). Here the railway and road cross the lake by a stone causeway ½ mile long and continue on the opposite bank, descending to the station of Capo-Lago. From here to Mendrisio (2½ miles) we rise at 1 in 61. At this station, on account of geographical conditions, large sidings have been laid out instead of at Chiasso, 3·3 miles distant, the frontier station at which we arrive at 1.54 p.m. Between the two points the last section of double track of Swiss ownership is encountered. Chiasso is some 400 yards from the Italian frontier, and here, except for four trains, the Customs examination takes place. For the train upon which we have travelled and three similar expresses the Customs examination takes place in the train between Lugano and Chiasso.

In the direction we are travelling the Italian Customs officers enter the train at Lugano, and in the reverse the Swiss conduct the examination before reaching that town. This is arranged in order to expedite the timing of the train, as, for reasons already mentioned, its load is fixed and not subject to daily variation. The Swiss locomotive is now detached, and in its stead an Italian engine of usually 2–6–0 or 2–6–2 type is attached for the journey to Milan, 32 odd miles distant, to which point the train runs "solid."

Our journey through Switzerland is now at an end, but in order to complete the running of this train a few remarks will be given of the journey on the Italian State Railways.

The short distance of 2·4 miles between Chiasso and Como, our next stop, is accomplished in 6 min. Leaving Chiasso at 2.5 p.m., more than half the journey is through a tunnel traversing the mountains skirting the Lake of Como, upon emerging from which there is obtained a very fine view of this well-known lake and town. We stop 2 min., during which a second engine is attached, for the fourth and last time, and on our journey we ascend at 1 in 55 to the last summit before the train descends without interruption to the Lombardian Plain. This summit is at Albate-Camelata, and the banking engine is detached without stopping the train. The downward grades from here to Milan vary from 1 in 100 to 1 in 250, passing Seregno, a junction of some importance, and Monza, 8 miles from our destination, where lines from four directions converge, including the Val Tellina, the first electrified route on the Italian State Railways. From here to Milan electrical and steam traffic is conducted over the same lines, some 60 trains daily being run over this section.

At the last station of Greco will be observed the junctions for the new circular railway and terminal station which have been under construction for a number of years. At the entrance to the Central station of Milan we negotiate a rather sharp curve, and the train comes to rest at 3.5 p.m., 8 hours' journey from Basle. The station, built in 1864 and enlarged from time to time, has 14 platforms besides two "through" roads. In view of the anticipated early completion of the future magnificent station on a new site, no great renovations are being undertaken. It is of interest to note in the booking hall two very fine

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frescoes entitled Industry and Progress, and the façade of the station is in keeping with the architectural embellishments of the city.

The writer has endeavoured to describe the journey as it appeared in the summer of 1914, but it is of interest to note in the space of a few remarks the developments towards electric traction which at that time had come about. As a preliminary to the complete electrification of the Swiss Federal Railways, the like equipment of the 67–68 miles of line "Erstfeld–Bellinzona" has been decided upon, and it is anticipated that the first full trials will take place during the spring of 1918. The power for this service will be obtained from two stations, one at Amsteg, at the north side of the St. Gothard range, and the other near Piotta, in the neighbourhood of the Ritom Lake, on the south side of the range. A plant totalling 71,000 h.p. is being installed. The Piotta power station takes its water from the Ritom Lake, and in summer, when the Reuss on the north side is very full, all the water at the Piotta station can be saved up for use in winter when the Reuss has sunk to a low level. Although in a very cold winter the two stations cannot be relied upon to supply the normal amount, other sources of water power are available. Six sub-stations will be installed, and it is anticipated that the tractive force of the electric engines will be up to one-third greater than that of the steam. This work is being executed at the present time at a cost of about one and a half million pounds.

While the journey by electric trains will be of undoubted improvement to the traveller owing to the large number of tunnels to be traversed, it will lose some of its interest to the "railwayist"; but the march of progress is inexorable and in its new form of operation the railway will have added pleasure to the general observer.

LONDON AND NORTH WESTERN RAILWAY.

New Roll of Honour.

ARTISTIC DESIGN BY MR. HARRY FURNESS.
The poster measures 59½ in. by 39½ in., and is of striking appearance.

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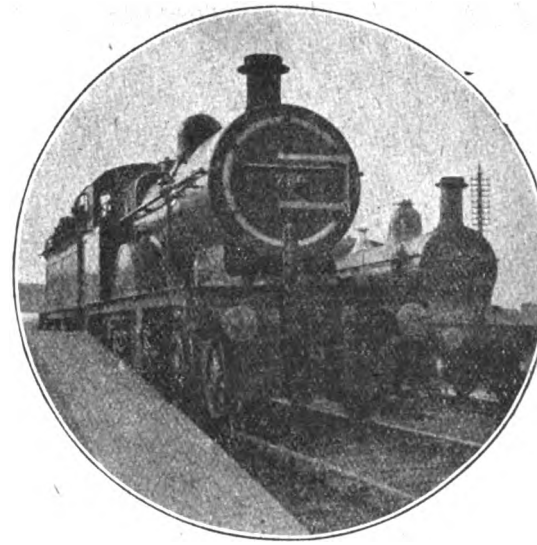
British Locomotive Practice and Performance.

By CECIL J. ALLEN.



Photo] [*A. B. MacLeod.*

MIDLAND RAILWAY.

Rebuilt class 3 4–4–0 engine, No. 769, and 4–2–2 engine, No. 668, at Gloucester.
No. 769 was rebuilt in 1916 and is fitted with Wakefield lubricator, extended smokebox and superheater.

TIME-TABLE changes succeed one another so rapidly in these perilous times that it is a matter of some difficulty to keep pace with them, let alone to find sufficient space in which to comment on them in any detail. Since last I made reference to the subject further drastic modifications have come into operation, influenced in certain cases by a definite restriction of maximum speeds. This I believe to have been the basis of the Midland Railway alterations dating from the beginning of the New Year, seeing that the latter, following as they do on the revolutionary slowings of January, 1917, and the further slackening in October of last year, relate principally to bookings on the level and downhill, and are framed apparently for a maximum speed not exceeding about 50 m.p.h. From some acquaintance with the principles of permanent way design and maintenance, I am inclined to think that the deleterious effects of high speed on a modern British main line track, with its heavy component parts and consequently high inertia, are somewhat over-estimated, especially on sections of line which are free from excessive curvature. It is doubtful, also, whether the wear and tear of an express locomotive in a reasonable condition of repair is appreciably greater on a well-laid road at 75 m.p.h. than at 45 m.p.h. These, however, are complex questions which I cannot attempt to discuss here. The result of restricting maximum speeds, of course, is that it is not possible to make up by fast downhill running, which involves but little increase in full consumption, time lost by the "loosening" of uphill schedules, which does tend materially to economise fuel, and that thus it is impossible to avoid very serious deceleration.

This is evident in the present Midland time-table, the journeys from London to most of the principal towns on the Midland system averaging in speed under rather than over 40 m.p.h. The best train to Leicester, for example, takes 2¼ hours, working out at 44 m.p.h.; to Nottingham, 2 hrs. 55 min., 42·3 m.p.h.; to Sheffield, 4 hrs. 1 min., 39·4 m.p.h.; to Leeds, 4 hrs. 47 min., 41 m.p.h.; to Bradford, 5 hrs. 55 min., 35·4 m.p.h.; and to Manchester, 4 hrs. 55 min., 38·5 m.p.h. For the fastest up journey in each case from 7 to 15 min. further are needed. One of the immediate results of these drastic slowings is that the Great Central Railway has attained to a position which it has never previously enjoyed during the years that the London Extension has been in existence, in that it is now the fastest route from London to nearly all the competitive points that it serves. As regards the quickest down journey, it beats the Midland by 21 min. to Leicester, 31 min. to Nottingham, 42 min. to Sheffield, and 47 min. to Bradford, while

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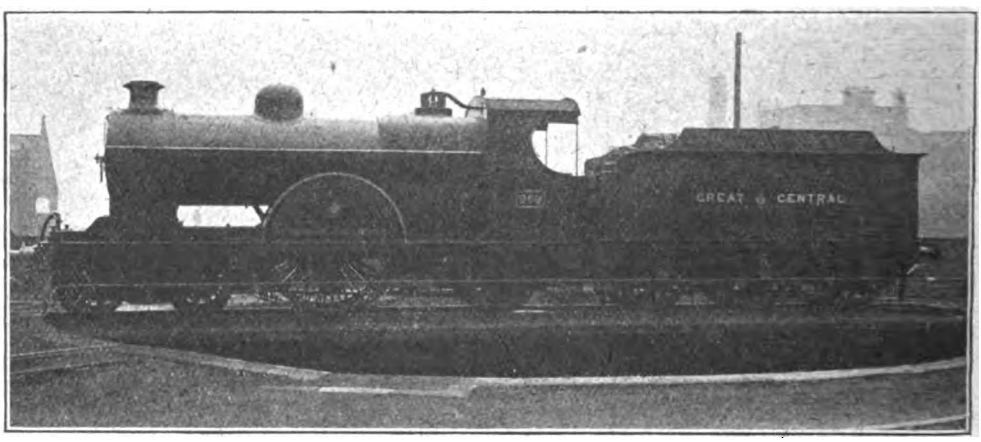
the wildest dreams of the promoters of the southward "push" in 1899 are more than realised in that the Great Central Railway has now the fastest train from London to Manchester, the 4 hrs. 40 min. of the 3.15 p.m. down beating the Midland best by 15 min., and that of the London and North Western Railway by 10 min.! Yet the distance to Central station, to which this train runs, is 22½ miles further than that covered by the London and North Western trains, and 23½ miles further than the Midland route, in addition to being far harder than both. The similar timing of the Great Central 2.15 p.m. up express from Manchester (London Road) to London—only slackened 9 min., despite its fast schedule and much increased load—is



Photo] [*W. H. Whitworth.*

GREAT CENTRAL RAILWAY.

4–2–2 locomotive, No. 969, as first rebuilt with large boiler.
This engine has now been again rebuilt with smaller boiler and with superheater.

bettered by 5 min. in the 2.10 p.m. London and North Western train from the same station, but is itself better by 30 min. than the fastest Midland time. To Leeds and Bradford the best Great Northern service, of course, is considerably quicker than that of the Midland Company, the chief times being 37 and 84 min. less respectively. In consideration of these facts, it is somewhat surprising that the Midland authorities continue the use of corridor stock and restaurant cars. One finds some difficulty also in understanding why, with such vastly increased times, it is still found necessary to pilot trains of by no means excessive weight.

Chronologically the next extensive batch of alterations were those which came into force on the London and South Western Railway on January 28th, and here again I believe I am right in saying that a restriction in maximum speeds—although not so drastic as that of the Midland Company—played an important part in the fixing of the new times. These London and South Western changes are to me among the most tragic that have yet taken place, as throughout the war up to this point a number of the fastest South Western schedules had remained practically unaltered, such as those of the 11 a.m. and 3.25 p.m. from Waterloo to Exeter (save for the extra 5 min. allowed for stopping at Woking in the latter case), the 12 noon, 2.10 p.m. and 4.17 p.m. from Exeter, and others. Such times as 91 min. for the 83·8 miles from Waterloo to Salisbury, 86 min. for the 75·8 miles thence to Sidmouth Junction, and 92 and 84 min. for the corresponding up journeys, or 64 min. for the 59·4 miles from Woking to Salisbury, or 67 min. for the 59·6 miles from Templecombe to Exeter, or 49 min. for the 46·5 miles from Basingstoke to Vauxhall, were, in my opinion—in consideration of the intermediate gradients—substantially the most brilliant schedules left to us in this country of recent months. Now these are increased to 101, 102, 107, 100, 74, 80 and 61 min. respectively (in the last-mentioned case to Waterloo instead of Vauxhall), and other timings are expanded in proportion. Most of the "crack" Bournemouth line trains had already been withdrawn or modified, and here the changes are inconsiderable, as the existing times did not necessitate the

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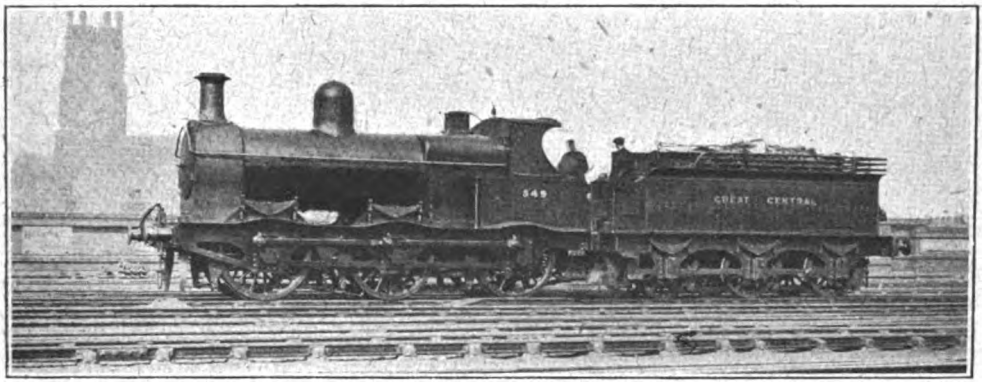
maintenance of exceptionally high speeds. So the standard non-stop time between Waterloo and Winchester, 66·7 miles, becomes 88 min. in each direction, from Waterloo to Southampton West, 79·3 miles, 103 min., and from Southampton to Waterloo 106 min. Standard times, indeed, are a feature of the new London and South Western tables, with the curious result that practically all the chief up expresses reach Waterloo at odd minutes, as is so often the case on the Continent.

Next come the Great Western and London and North Western alterations of April 1st last. Those of the former company are insignificant, consisting as they do principally of a slight extension of the times of the principal expresses, mostly in extra .5 min. allowances between stations. Thus the 10.15 a.m. West of England express gets 5 min. more to Westbury, 2 min. thence to Taunton, and 2 min. on to Exeter, making times of 107, 57, and 39 min. respectively for distances of 95·6, 47·3, and 30·8 miles. The corresponding up express hitherto due in Paddington at 5.30 p.m. is allowed 39 min. to Taunton, and 5 min. more thence to London, making a total of 2¾ hours for the latter 142·9 miles' non-stop run. On the old main line the 11 a.m. *ex*-Paddington has 3 min. more to Bath (106·9 miles in 118 min.), and reaches Bristol at 1.19 p.m., while the next stage of 75·6 miles to Exeter is allowed 89 instead of 85 min. as heretofore. The 4.0 and 6.30 p.m. expresses from Paddington now are allowed 104 min. to Chippenham, 94 miles (3 min. extra), but the 1.0 p.m. down gets a substantial increase of 7 min. between Reading and Bristol, not arriving at the latter place till 3.22 p.m. On the up journey the noon train *ex*-Bristol is unaltered on its 2¼ hours' non-stop schedule to Paddington, save for starting 10 min. later, but the afternoon express is not now due till 7.25 p.m., in virtue of a 10 min. increase between Bristol and London. The 2.10 p.m. *ex*-Bristol, however, is only eased by 1 min. between Bath and Reading, being now allowed 83 min. for the 70·9 miles. Various changes are made in the South Wales service, mostly for the worse, all the principal expresses being proportionately slackened, and allowances being made in most cases for conditional or regular stops at Severn Tunnel Junction—presumably to afford connection to Chepstow, which is now becoming a place of rising importance. The 11.20 a.m. now starts at 11.45 a.m. and calls at Didcot in place of Swindon, while the 5.0 p.m. down Fishguard boat express follows the course of the pre-war 4.30 p.m. Waterford boat train by being diverted *vid* Bath, and thereby losing 20 min. Further than this, the West to North expresses have at last attracted the attention of the time-table revisers, with the result that the smart Hereford–Shrewsbury times are increased from 62–65 min. to 70–75 min., and several of the fast trains disappear altogether.



Photo] [*P. F. Cooke.*

GREAT CENTRAL RAILWAY.

Rebuilt 0–6–0 outside framed goods engine, No. 549, at London Road, Manchester.

On the London and North Western Railway the principal changes consist in the incorporation of most of the remaining expresses on the Birmingham and Wolverhampton service in trains for the North as far as Rugby, and the deceleration of the hitherto largely unaltered Irish boat expresses. Thus the 9.30 a.m. down "Scotsman" *ex*-Euston, already conveying the

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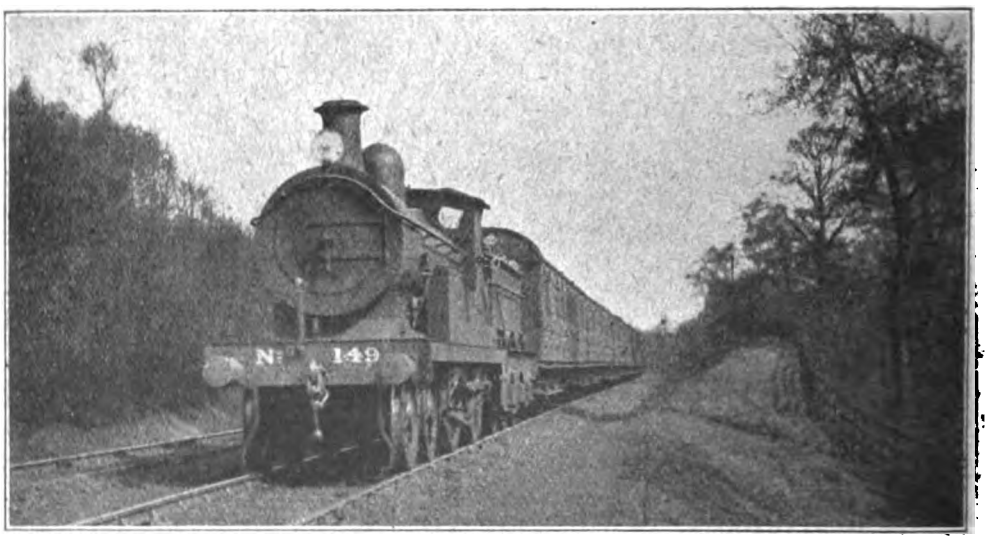
Liverpool portion of the pre-war 10.30 a.m. express, now adds the 9.20 a.m. to Birmingham, starts at 9.10 a.m., and calls at Blisworth in order to give connection to Northampton. The 11.50 a.m. to Birmingham and Liverpool is absorbed into the 12.0 noon semi-fast, the combined train starting at 11.55 a.m., and being slightly slowed in its semi-fast schedule. Again, the 4.35 p.m. to Birmingham is attached as far as Rugby to the 3.55 p.m. to Manchester and Liverpool; the latter starts at 3.50 p.m. and is diverted from Northampton to Blisworth, where a stop is made in order to maintain the Northampton connection. As regards the 6.55 p.m. down Birmingham express, this down starts at 8.10 a.m., the 8.45 p.m. at 8.20 p.m., while the starting time of the 9.25 p.m. is unaltered, but the latter express omits its previous stops at Rugby, Tamworth and Stafford; the arrival times at Holyhead in each case remain much the same as before, all the extra time allowances being taken up in the running. A slighter "loosening" of schedules takes place in the West Coast express schedules, as, in addition to the 9.10 a.m. down already mentioned, the 1.15 and 8.50 p.m. start 15 min. earlier, and the 7.30 p.m. 10 min. earlier, arrival times in Scotland remaining unaltered.

In the up direction the principal change is the amalgamation of the 2.5 p.m. from Bir-



Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

Up train near St. Mary Cray.

4–4–0 Stirling locomotive, No. 149, rebuilt with extended smokebox.

becomes part of the previous 7.10 p.m. Irish boat train, the combined express leaving at 6.40 p.m., omitting the Willesden call, and also giving connection to Northampton by means of a stop at Blisworth. Northampton, indeed, suffers considerably, losing at one fell swoop three direct trains from London and to the North, with which Blisworth connections are now made. One of the most substantial slowings on the main line is that of the 5.20 p.m. down Fleetwood boat express, which starts at 4.45 p.m., adds 18 min. to Stafford (133½ miles in 168 min.), 5 min. thence to Crewe, and the remainder of the 35 min. difference north of that point. Of the other Irish boat trains, the 8.30 a.m. mingham with the 12.5 p.m. from Manchester, as from Rugby onwards, the latter now calling at Rugby instead of Northampton for this purpose, and reaching Euston at 4.45 p.m. The 7.30 a.m. *ex*-Birmingham once more runs non-stop from Rugby to Willesden, the slow from Rugby at 8 a.m. taking up the working of the former from Northampton onwards on a somewhat "eased" timing. The up Irish boat trains are considerably slackened, the 2.30 (late 2.20) a.m. *ex*-Holyhead reaching London at 8.35 instead of 7.45 a.m., and the 12.5 p.m. getting up at 6.5 as against 5.40 p.m. Another loss to Northampton is the diversion of the 5.20 p.m. London express

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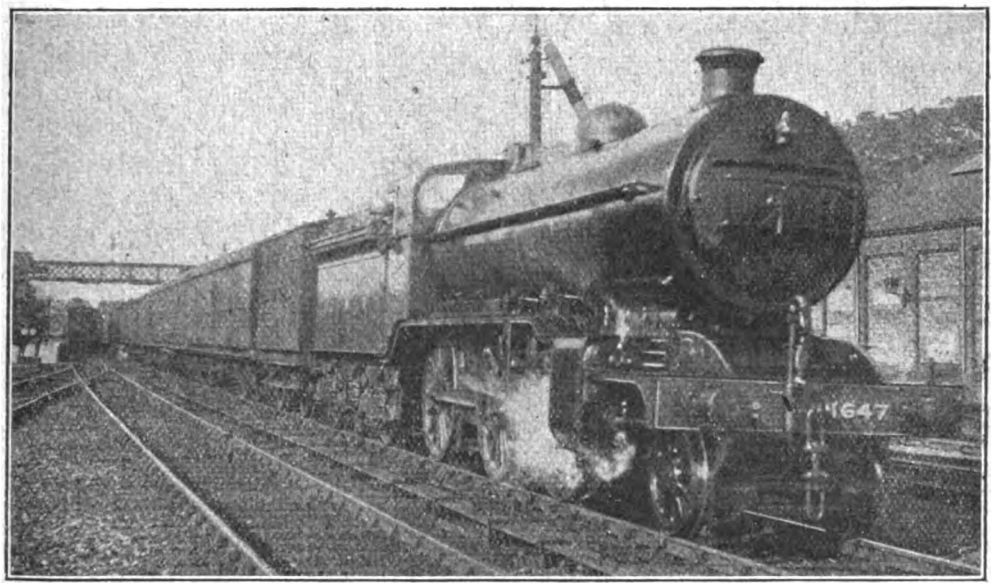
from Liverpool back to the straight line, with a non-stop run from Nuneaton to Bletchley, but no curtailment of total journey time; to serve Northampton the semi-fast from Nuneaton to London at 8.9 p.m. is reinstated. The up day "Scotsmen" are due at 9.0 and 11.20 p.m. instead of 8.45 and 11.15 p.m., and various other up expresses effect arrivals from 10 to 15 min. later than before. Considerations of space forbid me to detail the many other contingent alterations which have taken place. Generally speaking, almost all except the most liberal main line schedules have been opened out, especially those of the semi-fast trains, many of which, in view of their



Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.

Large-boilered 2-6-0 locomotive, No. 1647, leaving Sandy with up passenger train.

average loading, were sharply timed. Opportunity has been taken, also, to effect some greater standardisation of times, Willesden–Rugby and Rugby–Crewe, for example, being now generally allowed 91–94 min. in each direction.

A good many alterations of varying importance have taken place on other lines, of which the barest mention must suffice. The Cheshire Lines Committee from January 1st increased the time of the "Punctual" expresses between Manchester and Liverpool from 45 to 50 min., as referred to in detail in the April issue, leaving the Lancashire and Yorkshire Railway, with its new standard 45-min. time, the fastest route of the three between these points. On the South Eastern and Chatham Railway the morning train from Folkestone has been altered to call at Ashford instead of Tonbridge, and runs from there to Cannon Street in the excellent time of 72 min., which is practically at its pre-war speed. At the time of writing—the middle of April—no further all-round increase of times has come into operation, however, as has been foreshadowed, although the month of May will see some changes on many other railways, whose altered services will be in operation before these lines are in print. In the midst of these changes it is worthy of note that, apart from cancelled trains, the Great Central alterations hitherto made have consisted of but little other than extra minutes here and there, with the result that, in view of the 30 to 40 per cent. increase in the average loading of the trains, the task set to the locomotives is, in my opinion, considerably harder than it was before the war.

Take as an instance the 2.15 p.m. express from Manchester to Marylebone. The allowance of 9 min. for the 5 steep ascending miles from London Road station to Guide Bridge remains unaltered. One min. extra is allowed thence to Penistone, making 35 min. in all for this 23·4 miles, including its initial 18 miles of tremendous climbing. At Penistone 2 min. are economised, as the

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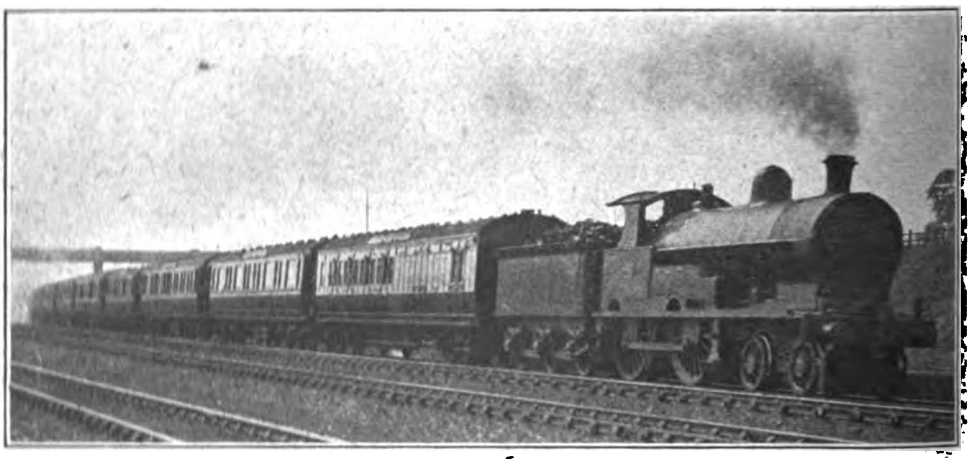
through Bradford coach is no longer attached, and the retained time of 17 min. on to Sheffield, with an increase of a minute there, leaves the departure from Sheffield 3.25 p.m. as previously. From Sheffield to Nottingham 1 min. more is allowed, at Nottingham another minute, from Leicester to Woodford 2 min., thence to Brackley 1 min., and on to London 2 min.—a total of 9 min. only since the beginning of the war. And these are no easy timings over a road such as the Great Central, with its long and steep banks, such a booking as 40 min. for the 34 miles from Leicester up to Woodford, including 15 miles up at 1 in 176, and nearly 9 others either slightly uphill or not easier than level, providing the engines with a stiffish task when loads exceed 250 tons very full. It was necessary to pilot this load over Woodhead, and for this purpose we had the services of 4–4–2 tank No. 1061 attached next the train, the express locomotive—No. 364, *Lady Henderson*, 4-4-2 superheated 3-cylinder compound—leading as is customary on the Great Central Railway when the pilot is inferior in power to the train engine. The combination was a curious one, and I cannot recollect having ever previously seen an express engine piloting a tank engine on a first-class express. On the second occasion the load was lightened by the omission of the two saloons, and thus only totalled 194 tons tare (205 tons full), which No. 264, simple non-superheater "Atlantic," essayed to take unassisted.

Out from Manchester, Nos. 364 and 1061



[Photo] [*F. E. Mackay.*

LONDON AND NORTH WESTERN RAILWAY.

American Boat express hauled by 4-4-0 locomotive, *William Froude* ("George the Fifth" class).

behind the tender. But the proof of the pudding is in the eating, and I cannot do better than illustrate these remarks by describing a couple of excellent runs that I have enjoyed on this train during the past fortnight. They have, indeed, proved to me most refreshing reminders of the piping times of peace.

It will be convenient if I deal with the two journeys at the same time, stage by stage; in each case I travelled through from Manchester to Marylebone. On the first run the load from the start consisted of three 60 ft. corridor 8-wheelers, including restaurant car, two of the 60 ft. saloons and a 60 ft. non-corridor, together with two earlier bogie vehicles, totalling 261 tons empty and 280 tons in all, the non-corridor stock being ran to Guide Bridge in 9 min. 35 sec., and No. 264 in 10 min. 20 sec.—a slight excess in each case over the tight allowance of 9 min.—but of the distance of 5 miles 4 rise continuously at 1 in 173–100–133. The tug of war, however, comes in starting from Guide Bridge, a level ¼-mile and ¼-mile up at 1 in 151 being succeeded by the following continuously ascending gradients: 1 mile at 1 in 100 and 0·9 miles at 185 to Newton; 1·6 miles at 143 past Godley; 1 mile at 462 to Mottram; 1·3 miles at 123 and 0·4 miles level to Dinting; 2·5 miles at 100 past Hadfield; 5·2 miles at 117 to Woodhead; and 3 miles at 201 through the tunnel to Dunford Bridge—a formidable 17¼ miles' sequence. On the double-headed train we attained 48 m.p.h. on the 1 in 462 to Mottram

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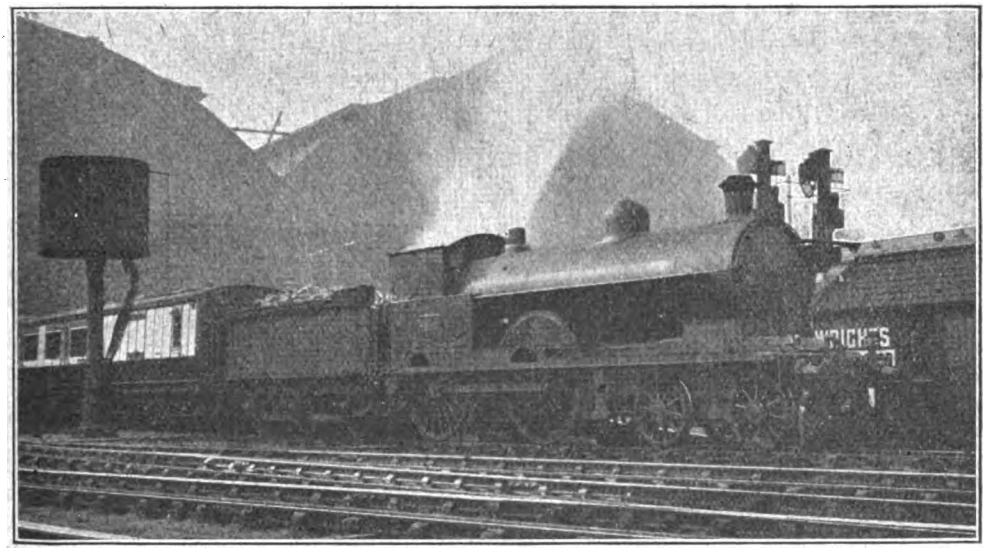
and 48½ on the level strip over Dinting viaduct, after which we settled down to an absolutely unvarying 41 on the long 1 in 117 to Woodhead. Entering the tunnel at 43 m.p.h., we left it at 37 m.p.h., and went very modestly thence down to Penistone. No. 264 was not so speedy uphill, as we did not exceed 44½ m.p.h. at Mottram and 44 at Dinting, and fell to 34½ m.p.h. on the 1 in 100 past Hadfield. But then followed a remarkable recovery on the 1 in 117, the rate gradually increasing from 34½ to 40 m.p.h. before we entered the tunnel, and 42 at the east end, after which speed was again moderate to Penistone. From Guide Bridge the respective times of the two runs were :- to Godley, 3·3 miles, 6 min. 40 sec. and 7 min. 25 sec.; to Dinting, 6·9 miles, 11½ min. and 12 min. 35 sec.; to Woodhead, 14·2 miles, 22 min. and 24 min. 25 sec.; to Dunford Bridge, 17·4 miles, 26 min. 50 sec. and 28 min. 55 sec.; and to Penistone, 23·4 miles, 34¾ min. and 36 min. 25 sec. Thus the first trip was ¼ min. under schedule, and the second nearly 1½ min. over it. From Penistone down to Sheffield, with very cautious running, we took on the first occasion 16½ min. for the 12·9 miles, and on the second 17 min. 20 sec., or 16½ min. net (as in this instance a signal check was included), against 17 min. booked.

After Sheffield we lost on the earlier run the services of No. 1061, and also one of the large saloons, the compound "Atlantic" being now left to haul a gross load of 245 tons; on the second trip we exchanged No. 264 for a superheated "Atlantic," No. 361, the load of 205 tons being increased to 210 in virtue of a large influx of passengers and luggage. No. 364 made the better start over Darnall "hump," which includes 2 adverse miles at 1 in 144–155, and was through Woodhouse, 5 miles, in 8 min. 35 sec., against 361's 8 min. 50 sec. Both engines slackened speed over Woodhouse Junction, and on the undulating, though principally rising 7 miles thence to Staveley Town the simple beat the compound by attaining 60 m.p.h. against the latter's 57½, the respective times being 8 min. 5 sec. and 8 min. On the ensuing 3·7 miles' ascent at 1 in 100, No. 364 fell to 33 m.p.h., but No. 361 only to 34½ m.p.h.; the complete and unbroken climb of 8·3 miles from Staveley to Pilsley occupied 12 min. 35 sec. in the former case and 12 min. 25 sec. in the latter. Beyond the summit the simple engine ran more briskly, touching 60 m.p.h. beyond Tibshelf, only falling to 52½ at Kirkby South Junction, and maintaining 64–68 m.p.h. on the falling grades to Basford; thus the times from Pilsley to Kirkby South Junction, and thence to Basford, 7·1 and 9·2 miles respectively, were 7 min. 35 sec. and 8 min. 55 sec. against



Photo] [*W. H. Whitworth.*

LONDON AND NORTH WESTERN RAILWAY.

"Precursor" class 4–4–0 locomotive, No. 2017, *Tubal*, at London Road station, Manchester.

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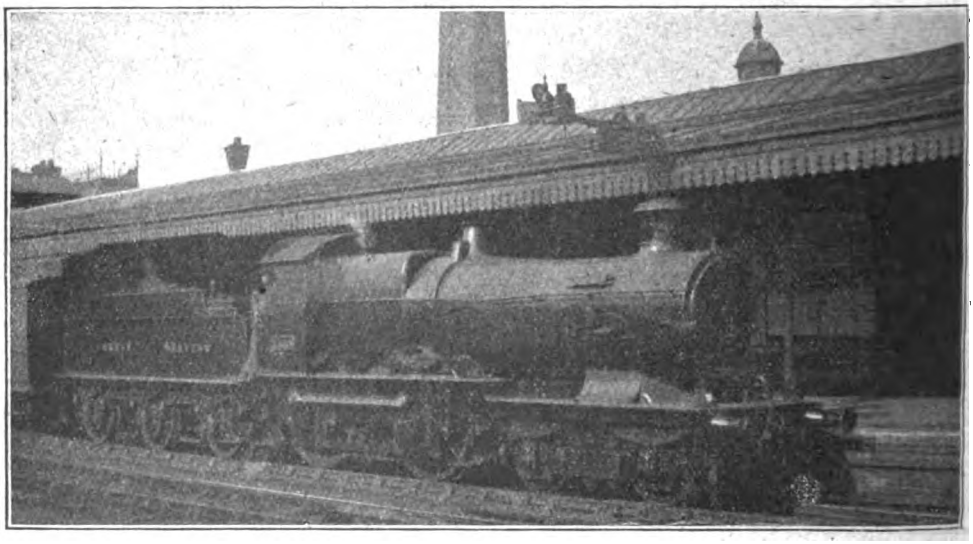
the compound's 8 min. and 9 min. 10 sec. On both runs severe delays were experienced outside Nottingham, the final 1·6 miles taking 4 min. 40 sec. on 364's run, and 3¾ on that of 361. Total times from Sheffield behind the compound and the simple were respectively as follows: to Staveley, 12 miles, 16 min. 40 sec. and 17 min.; to Heath, 17·9 miles, 25 min. 40 sec. and 25 min. 50 sec.; to Pilsley, 20·3 miles, 29¼ min. and 29 min. 25 sec.; to Kirkby South Junction, 27·4 miles, 37¼ min. and 37 min.; to Basford, 36·6 miles, 46 min. 25 sec. and 45 min. 55 sec.; and to Nottingham 51 min. 5 sec. and 49 min. 40 sec., or 49 and 48½ min. net. Thus we were well on the right side of the 50 min. schedule in each case.

From Nottingham we went forward with the same engines, but the load was increased in each case, as usual, by a large bogie fish van, loaded to its full capacity, bringing the aggregate weight behind the compound to 275 tons, and behind the simple to 240 tons. Excellent starts were made to East Leake on each run, No. 364 attaining 62·5 m.p.h. over some 6 miles of practically level track, and No. 361 as much as 65 m.p.h. So Ruddington, 4·4 miles, was passed in 6 min. 20 sec. on both trips, and East Leake, 9 miles, in 11 min. 10 sec. and 11 min. respectively. Minimum speeds at Barnston were 52½ and 56½ m.p.h. (after 4 miles' climb, of which 3¼ are at 1 in 176), but between Barnston and Loughborough we were badly delayed on both occasions by permanent way repairs. So we took 16 min. 25 sec. and 17 min. 10 sec. to pass Loughborough, 13·6 miles, 22 min. 25 sec. and 22 min. 40 sec. to Rothley, 18·4 miles, and 28 min. 5 sec. and 28 min. 20 sec. to Leicester stop, net times, however, not exceeding 26 and 25¾ min. for this sharply undulating 23·4 miles' run. No. 361 made decidedly the faster running, recovering from the check to 52½ m.p.h. on Quorn bank and 59 at Rothley, while only falling to 54 at Belgrave, but No. 364 started and finished more briskly, from Belgrave into Leicester in 2 min. 35 sec., with a top speed of 65 m.p.h., being a smart time.

At Leicester a Neasden 4–4–0 "Director" came on in each case to replace our Manchester engine, the 275-ton load being taken on by No. 431, *Edwin A. Beazley*, and the 240-ton train by No. 433, *Walter Burgh Gair*, and the running thenceforward to London on both trips was magnificent. The starts were similar, Whetstone, 4·7 miles, being passed on each occasion in exactly 7 min., a speed of 55½ m.p.h. having been attained on the easy mile from the start and 3 subsequent miles' ascent at 1 in 264–660. On Ashby bank (6·6 miles at 1 in 176) No. 431 fell to 48½ m.p.h. and No. 433 to 49½.



Photo] [*A. B. MacLeod.*

GREAT WESTERN RAILWAY.

Unnamed "Camel" class 4–4–0 locomotive, No. 3440, at Gloucester.

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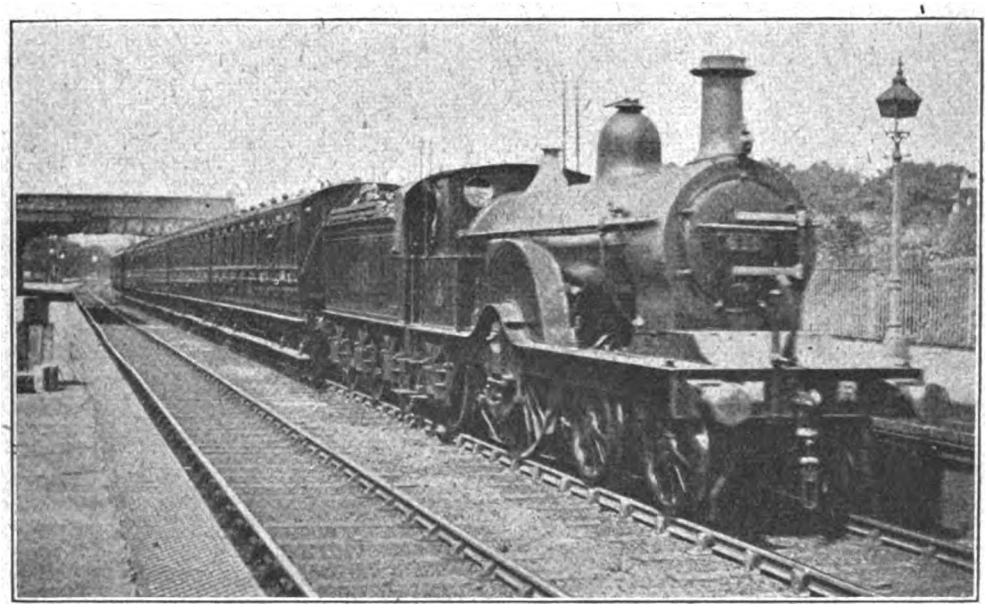
while maxima of 67 m.p.h. in each case at Lutterworth were succeeded by sustained speeds of 77½ and 79 m.p.h. respectively before Rugby. The 2 miles' easy ascent to Rugby station reduced 431's speed to 67 m.p.h., but No. 433 only fell to 70½ and subsequently bettered the former engine's times by sustaining 76½ m.p.h. on the slightly falling length to Braunston, against 74 m.p.h. Catesby bank (6½ miles at 1 in 176) always effects a much more substantial reduction in the speed, curiously enough, than the almost identical ascent to Ashby, and so it was on these runs, No. 431 entering the tunnel at 46 m.p.h. and leaving it at 39, much the better of it up Catesby bank, but I am inclined to think that the driver of No. 431, with time well in hand, was not "pushing" his engine.

Further time was gained between Woodford and Brackley, this undulating 9·8 miles' stretch being covered in 12 min. 35 sec. start-to-stop on the first run, and 12 min. 10 sec. on the second. The schedule to restarting is 14 min., of which 1 min. is probably allowed for the stop. On the favourable start from Brackley both engines got away smartly, touching 74 m.p.h. in each case between Finmere and Calvert. So Finmere, 4·8 miles, was passed by No. 431



Photo] [*F. H. Stingemore.*

MIDLAND RAILWAY.

Johnson 4–2–2 engine, No. 610, with new double cab, hauling an up local train.

while No. 433's minima were 48½ and 45 m.p.h. respectively. Times from Leicester were therefore as follows: to Ashby, 9·2 miles, 12 min. 25 sec. and 12¼ min.; to Lutterworth, 13·1 miles, 16 min. 50 sec. and 16 min. 40 sec.; to Rugby, 19·9 miles, 22¾ and 22½ min.; to Braunston, 24·6 miles, 26¾ min. and 26 min. 25 sec.; to Charwelton, 31·6 miles, 35¼ min. and 34 min. 20 sec.; and to Woodford stop, 34 miles, 38 min. 50 sec. and 37 min. 40 sec. In consideration of the loads and the adverse grading, these were first-class times, and well inside the present 40-min. schedule; it will be observed that No. 433, with the lighter train, had in 6 min. 25 sec., and by No. 433 in 6¼ min.; Grendon Underwood Junction, 12·5 miles, at slightly reduced speed in 13 min. 10 sec. and 12 min. 55 sec.; Quainton Road Junction, 14·9 miles, at a substantially reduced rate, in 15 min. 50 sec. and 15 min. 30 sec.; and Aylesbury, 21·3 miles, in 22 min. 40 sec. and 22¼ min. Both engines were doing 62 m.p.h. at this point, but in each case we had time so well in hand that the ascent to Amersham was taken moderately. On the 6½ miles up, mainly at 1 in 117, past Wendover, No. 431 fell to 39½ and No. 433 to 38 m.p.h., but whereas the former engine touched 71½ m.p.h. at Missenden and fell to

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49½ on the final 2¼ miles at 1 in 160 to Amersham, the figures in 433's case were 72½ and 52 m.p.h. respectively. So Wendover, 26 miles, was passed by No. 431 in 28¾ min., and No. 433 in 28½ min., and Amersham, 35·7 miles, in 39 min. 40 sec. and 39½ min. A leisurely descent to Rickmansworth was made on each run, with frequent brake applications, the 6·4 miles occupying 6¼ min. in the former case and 6½ in the latter, making 45 min. 55 sec. and 46 min. respectively for the 42·1 miles from the start, and the slack was, as usual, very severe. The sharply undulating 8 miles from Rickmansworth to Harrow took 9 min. must be noted that, despite the continued tightness of these schedules, time was gained on almost every section. South of Sheffield, indeed, the engines had 5¾ min. to their credit, allowing for delays, on the first run, and no less than 8 min. on the second, which could easily have been expanded to 7 and 10 min. or more respectively by faster work south of Aylesbury, had this been necessary. Altogether these were two most pleasant experiences.

During last summer, when the principal Great Central expresses were loading very heavily, I had one return trip to Nottingham, and in consideration of the fact that

Photo] [*P. S. A. Berridge.*

SOUTH EASTERN AND CHATHAM RAILWAY.

London and North Western Railway Hospital train.
South Eastern and Chatham Railway 4–4–0 locomotive, No. 488.

50 sec. and 9 min. 25 sec., and the final 9·2 miles into Marylebone, run very cautiously after a severe slack through Harrow station, 11 min. 5 sec. and 11 min. 35 sec. Total times for the 59·3 miles from Brackley were therefore 66 min. 50 sec. in the case of No. 431, with 275 tons, and 67 min. exactly in that of No. 433, with 240 tons, but it is quite evident that the latter engine could have completed the journey comfortably in 65 min., had we not been so well on time. As it was, *Walter Burgh Gair* reached Marylebone 2 min. early, and *Edwin A. Beazley* dead on time, after two most satisfactory runs, and it we were piloted in each direction, the times were much inferior to those foregoing. On the 12.15 noon *ex*-Marylebone, with nine 60 ft. 8-wheelers, weighing 312 tons empty and 330 tons loaded, our engines were two 4–4–0's, No. 1014 of Robinson's earliest 4–4–0 type and No. 429 of the "Director" class. *Apropos* of curiosities, here was one in that the former had previously borne a portion of the name now carried by the latter, *i.e.*, *Sir Alexander* and *Sir Alexander Henderson* respectively. It only needed the services of *Lord Faringdon*, as a "pusher," say, to complete the possibilities in this direction, but the last-mentioned engine was

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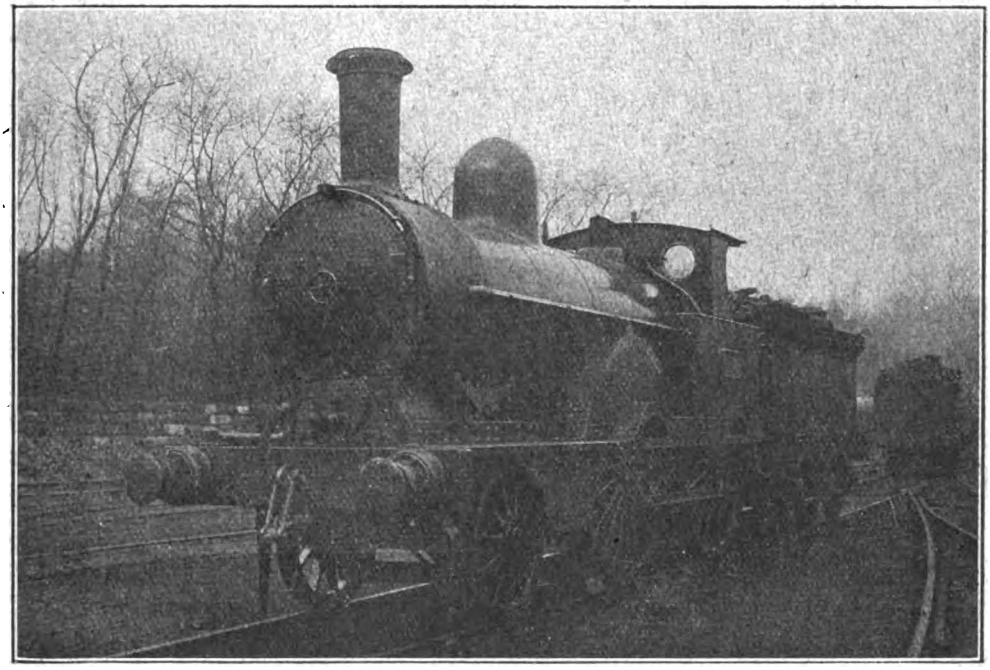
not at that time in existence. Throughout the journey, which was much delayed, we barely kept time, even allowing for the checks. From Marylebone we passed Neasden Junction at reduced speed, 4·8 miles, in 9¼ min.; Northolt Junction, 11·6 miles, in 18 min. 10 sec.; Gerrard's Cross, 18·8 miles, in 26 min. 50 sec.; Beaconsfield, 23 miles, in 32 min. (at a minimum of 51 m.p.h.), and reached High Wycombe, 27·9 miles, in 37 min. 25 sec., a loss of ½ min. Thence we were through Saunderton, 4·8 miles, in 8 min. 20 sec., maintaining 47 m.p.h. up the 1 in 164, but were badly booked, but actual time was 35 sec. more, in virtue of a signal check at Culworth Junction. Similarly from Woodford to Rugby our net time for the 14·1 miles was 16 min. as scheduled, but actually it was 18 min. 20 sec., a bad permanent way check being encountered beyond Braunston; the latter station, 9·4 miles, was passed in 11½ min., at 75 m.p.h. From Rugby we passed Lutterworth, 6·8 miles, in 9 min. 5 sec.; Ashby, 10·7 miles, in 13 min. 10 sec.; Whetstone, 15·2 miles, in 16 min. 55 sec. (at 75 m.p.h.); and reached Leicester, 19·9 miles, in 21 min. 35 sec., 25 sec. under



Photo] [*Chas. S. Lake.*

LONDON AND NORTH WESTERN RAILWAY.

"Precedent" class locomotive, No. 870, *Fairbairn*, at Bletchley.

checked by signal outside Princes Risborough, and took 14 min. to the stop. Allowance for this 8·1 miles' length is 13 min., and our net time was about 12¾ min. From Risborough to Brackley we did rather poorly, not exceeding 67 m.p.h. at Haddenham, and taking 10 min. 50 sec. to Ashendon Junction, 9·4 miles; 16 min. 55 sec. to Grendon Underwood Junction, 15·3 miles; 25 min. 35 sec. to Finmere, 23 miles (our speed fell to 49½ m.p.h. on the 1 in 176); and 30 min. 55 sec. to Brackley, 27·8 miles —a loss of a minute. Net time from Brackley to Woodford, 9·8 miles, was 13 min. as schedule. Here No. 429 was exchanged for non-superheater "Atlantic" No. 1089, No. 1014 continuing to act as pilot, and as the train had gradually been filling to repletion, the load was now fully 340 tons. We passed Rothley, 5 miles, in 8 min. 5 sec., attained 68 m.p.h. before Loughborough, and reached that town, 9·8 miles distant, in 13¼ min. Thence we attained 40 m.p.h. on the 1 in 176 ascent to Barnston, passed East Leake, 4·6 miles, in 8 min. 5 sec.; Arkwright Street, 12·7 miles, in 15 min. 35 sec. (having attained a top speed of 70½ m.p.h. at Ruddington), and reached Nottingham in 17¼ min. Thus

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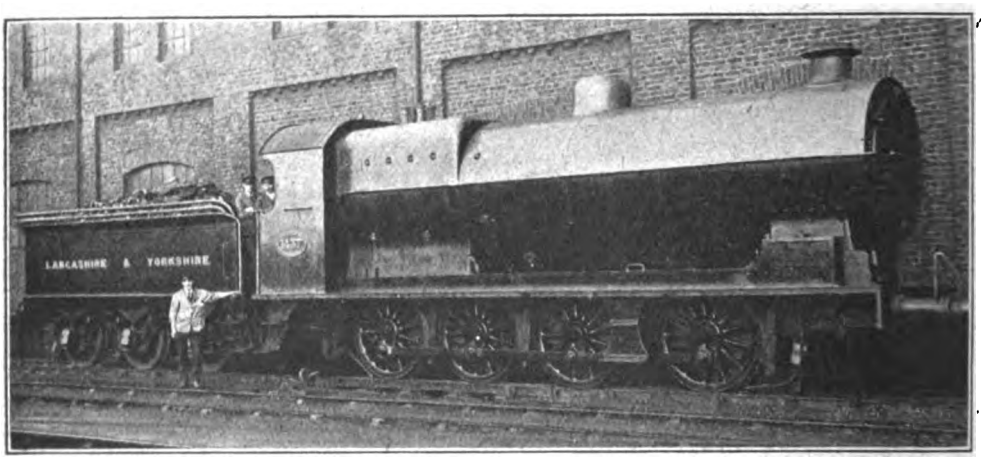
¼ min. was lost on each of these stages, and our eventual arrival was nearly 14 min. behind time. At Nottingham No. 1014, which had come through from London next the train, was replaced by another engine of the same type, while the "Atlantic" pilot remained, these successive locomotive changes at Leicester and Nottingham being quite complicated in character.

From Nottingham I returned by the Manchester train previously referred to, and, except that we had No. 1089 in place of No. 1083 from Nottingham to Leicester, the load of 330 tons and the engine were identical with those of the down journey, *i.e.*, 1089 and 1014 to Leicester, and 429 and 1014 thence to London. From Nottingham we did rather feebly, taking 6 min. 50 sec. to Ruddington, 12¼ min. to East Leake, 17 min. to Loughborough (passed at 69 m.p.h. after a minimum of 47½ at Barnston), 21 min. 50 sec. to Rothley, and 27 min. 10 sec. to Leicester. Thenceforward there was a slight improvement, as we touched 53 m.p.h. before Whetstone, maintained 46½ on Ashby bank, attained 76½ m.p.h. before Rugby and 70½ at Braunston with an intervening minimum of 66, entered Charwelton tunnel at 44 m.p.h. and left it at 41, thereby achieving times of 7 min. 5 sec. to Whetstone, 12¾ min. to Ashby, 17 min. 25 sec. to Lutterworth, 23 min. 25 sec. to Rugby, 27 min. 25 sec. to Braunston, 36 min. 10 sec. to Charwelton and 39 min. 35 sec. to Woodford, a slight improvement on schedule. From Woodford to Brackley we took 13 min. 5 sec., or virtually exact time, but the best work was done on the final stage. Touching 74 m.p.h. beyond Finmere, we passed Grendon Junction in 13½ min. and Quainton Road Junction in 16 min. 20 sec., slacking to an unnecessary degree in each case, and Aylesbury in 23 min. 5 sec. Very good work was done up to Amersham, speed only falling to 49 m.p.h. beyond Wendover and 55½ at Amersham, with an intervening maximum of 75 m.p.h. at Missenden, while we touched 75 m.p.h. on Chorley Wood bank. So we gained from 1½ to 2 min. on the times of the preceding runs as between Aylesbury and Ricksmanworth, passing Wendover from Brackley in 28 min. 50 sec., Amersham in 38¾ min., and Rickmansworth in 44 min. 55 sec. Rickmansworth to Harrow took 9 min. 55 sec., and Harrow to Marylebone 11 min. 10 sec., making a total time from Brackley of exactly 66 min. Thus on this final stage schedule was improved on by 3 min., but at the same time the work of the engines on the double-headed trains shows up but poorly in comparison with the outstanding efforts of the unpiloted "Directors" previously recorded.



Photo] [*W. H. Whitworth.*

LANCASHIRE AND YORKSHIRE RAILWAY.
0-8-0 locomotive, No. 1437, at Bury.

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Photo] [*Elliott & Fry.*

MAJOR ARTHUR WATSON, C.B.E.

Superintendent of the Line and Assistant General Manager.

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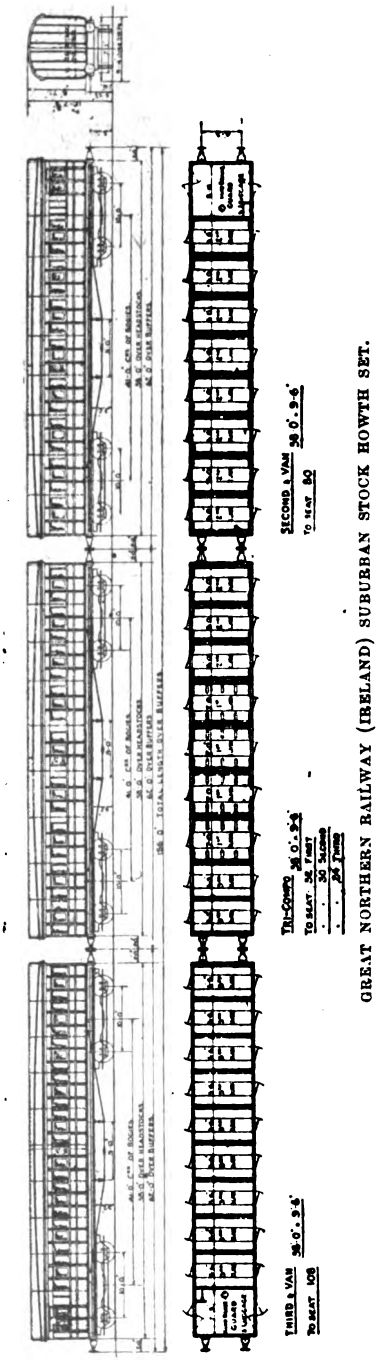
New Howth Set of Carriages.

GREAT NORTHERN RAILWAY (IRELAND).



GREAT NORTHERN RAILWAY (IRELAND) SUBURBAN STOCK HOWTH SET.

BY the courtesy of Mr. Glover the RAILWAY MAGAZINE is able to illustrate by diagram, a set of new individual coaches in service between Amiens Street, Dublin, and Howth. This set is composed of three carriages each 58 ft. long by 9 ft. 6 in. wide over corner pillars.

The third class brake is composed of 9 compartments and brake compartment, to seat 108 passengers. The tri-compo has two third class, four first class and three second class compartments, seating capacity 24 third class, 32 first class and 30 second class passengers. The second class brake van has 8 compartments and brake compartment, seating capacity 80 passengers. Total seating capacity of the set is :—32 first, 110 second, and 132 third class passengers.

Total weight is 95 tons empty, and the total length of set over buffers is 186 ft.

Constructed of mahogany, the bodies of the vehicles are varnished to show the natural grain of the timber. The underframes are of steel, fitted with double rubber buffers ; the bogies are of pressed steel disc wheels, 3 ft. 7 in. diameter.

Each interior of the first class compartments is finished in mahogany, veneered, seats and backs are upholstered in Moquette of green, floral design and laced to match. The ceilings and partitions to the level of the net racks are finished with plain Tynecastle, painted white, the bracket boards are fitted with panoramic photographic views and mirrors.

The interior finish of the second class is similar to that of the first class, with the exception that it is of plain mahogany, and has dark, green Moquette trimmings.

The interior of the third class compartments is finished in pitch pine. The ceilings and partitions to level of parcel racks are finished with Lincrusta, painted white. The seats and backs are upholstered in repp.

All compartments are provided with roof ventilators and each vehicle is equipped with electric light, steam heating, and automatic vacuum brake.

These coaches were built at Dundalk Works to the design of Mr. G. T. Glover.

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The Great Northern and London and North Western Joint Railway.

By H. L. HOPWOOD.

LYING somewhat off the beaten track of the through traveller and running nearly parallel with the North and South main routes of the Great Northern and Midland Railways in the counties of Nottingham and Leicester, the railway bearing the above title is probably little known to the majority of readers, except those resident in the district. Comprising a local system which extends from two different points on the Great Northern Grantham and Nottingham line to the London and North Western Railway near Market Harborough, the railway is not often used by passengers travelling from London to the North, and *vice versa*, as it occupies a position too near to alternative routes of the Midland, Great Central and Great Northern Railways—routes which are able to offer more facilities in the way of express trains and in other directions. The largest town on the system is Melton Mowbray, at which place the Midland Railway is a competitor for traffic to and from London and the North.

Whilst the line may be regarded as primarily serving local requirements, it is also of importance for the reason that it provides the London and North Western Railway with a direct route between London and the coalfields of Nottinghamshire, Derbyshire and South Yorkshire. It has been said that the traffic is primarily local in character; nevertheless, in normal times, trains running from and to the parent systems and over the Joint Line, traverse routes which, to the uninitiated, are peculiar and complex, and of sufficient interest to merit some notice in these pages.

The Great Northern and London and North Western Joint Railway owes its inception chiefly to "political" considerations. In the year 1871 a railway from Newark to Leicester was suggested, it being then considered that Leicestershire was somewhat deficient in North and South rail communication. At the same time, the Manchester, Sheffield and Lincolnshire Railway was proposing an extension of its line from Doncaster to Market Harborough, which would cover much the same ground as that of the proposed Newark and Leicester line. The Manchester, Sheffield and Lincolnshire Railway asked the London and North Western Railway to join it in this scheme, but the latter Company declined the offer. Contemporaneously, the Midland Railway was also promoting lines of its own in the district. All these proposals were afterwards withdrawn, except the Newark and Leicester, and this the Great Northern Railway took over in 1872 from the private individuals who had promoted it.

When the Bill came before Parliament, the line was sanctioned only as between Newark and Melton Mowbray, the Leicester portion being thrown out. A Manchester, Sheffield and Lincolnshire and Midland scheme for a joint line from Worksop to Rushton (which was a revival in another form of the previous Doncaster and Market Harborough line) was also rejected as a whole, portions only being sanctioned, but as this did not suit the promoters, the matter was dropped.

The Great Northern Railway again came forward with a Bill to extend the Newark and Melton Mowbray line to Market Harborough, with a branch to Leicester, and this time it had persuaded the London and North Western Railway to become its ally, by offering the latter running powers to Nottingham and Doncaster. Parliament refused to sanction this "joint" project, but allowed the Leicester line as a purely Great Northern undertaking.

In the following year the promoters met with success, the Bill for a Great Northern and London and North Western Joint Railway being sanctioned on July 30th, 1874. The London and North Western Railway, however, preferred not to become a joint owner of the section between Newark and Bottesford, but agreed to do so in the case of the line from Stathern to Saxondale, which, although not included in the original project, it was now necessary to construct in order that the London and North Western Railway might obtain entry into Nottingham.

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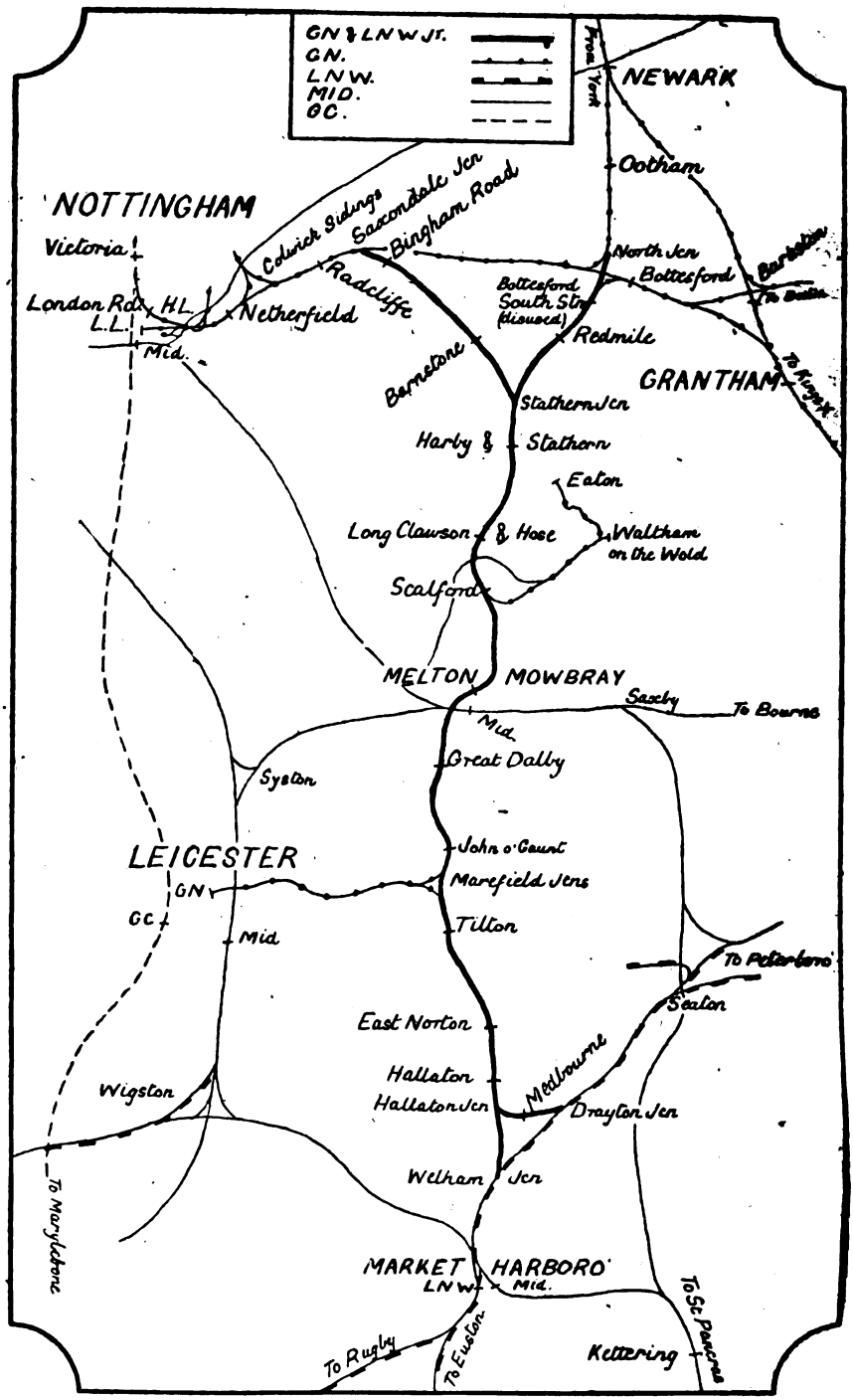

GREAT NORTHERN AND LONDON AND NORTH WESTERN JOINT RAILWAY.

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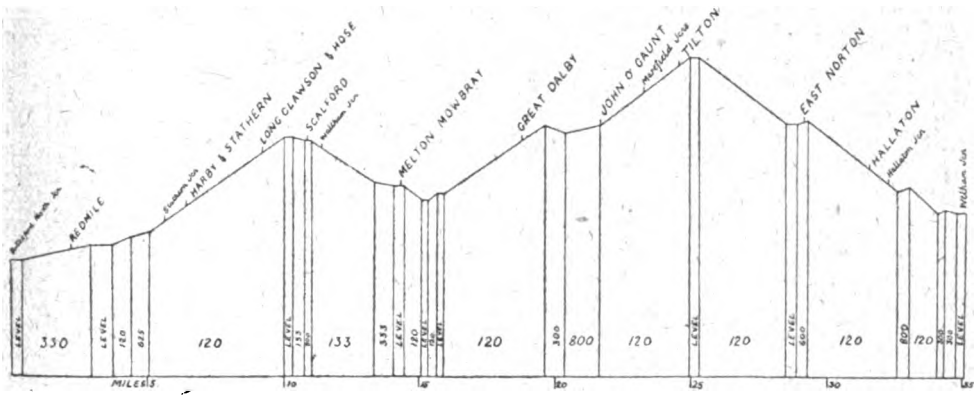
Of the two partners in the joint undertaking, undoubtedly the London and North Western Railway secured the better bargain, for it obtained running powers to the Nottinghamshire and Derbyshire coalfields *viâ* Nottingham, and the South Yorkshire coalfields *viâ* Doncaster. In return for these facilities, the Great Northern Railway obtained entry into Northampton and Peterborough *viâ* the London and North Western Railway, the railway between Market Harborough and Brampton being doubled to accommodate its traffic. The London and North Western Railway also constructed a line between its Seaton and Wansford stations in order to give the Great Northern Railway access to Peterborough from the West. On its own part, the Great Northern Railway made a connection (1 mile 50 chains) from the main line at Fletton to join the London and North Western Peterborough branch at Longville. As regards North and South traffic, the Great Northern had long held practically the monopoly of this at Peterborough, but the new running powers gave it an additional entry from the West, which, in view of the opening of the Leicester branch about this time, was considered an event of no little importance.

The Great Northern line from Newark to Bottesford West Junction was opened July 1st, 1878, and the first portion of the Joint Railway—that from Saxondale Junction to Melton Mowbray—was ready for goods traffic a year later, passenger traffic starting September 1st, 1879. The continuation of the Newark and Bottesford line from Bottesford North Junction to Stathern Junction followed December 15th, 1879, at which date the Melton Mowbray to Welham Junction section, and the Medbourne branch, were also brought into use, although Medbourne station was not utilised until 1883. When the line was constructed, a connection between it and the Midland Railway at Melton Mowbray (known as Sysonby Junction), was made, but being little, if ever, used, it was removed in October, 1882.

There is to be seen on the Joint Railway a derelict station, formerly known as Bottesford New, or Bottesford South. Being in close proximity to the Bottesford station on the Grantham and Nottingham line, it was early realised that its existence was not justified; accordingly, the station was closed April 29th, 1882, and at about the same time the spur line from Bottesford South to Bottesford West was taken out.

The mileage of the railway is 45 miles 9 chains, made up as follows:—



GRADIENT DIAGRAM, BOTTESFORD NORTH JUNCTION TO WELHAM JUNCTION.

	Miles.	Chs.
Saxondale Junction to Welham Junction	35	75½
Bottesford North Junction to Stathern Junction	5	69
Hallaton Junction to Drayton Junction	3	24½
Total	45	9

The line is of double track throughout, except the last named section, which was converted from double to single line in 1905. Gradients are not very severe, 1 in 120 being the steepest inclination, but this occurs frequently in unbroken stretches of three or four miles and more. The only tunnel on the line is Hose Tunnel (834 yards), situated between Long Clawson and Scalford stations. The largest station is Harby and Stathern Junction, where there are four platform faces, the down platform being an island and the up platform having a bay at

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the south end. Generally speaking, station buildings are very good, Melton Mowbray and Redmile deserving special notice as artistic structures.

At Scalford, a single line mineral branch of the Great Northern Railway diverges on the up side and, curving sharply, proceeds north for a few miles to the ironstone districts of Eaton and Eastwell. Passenger trains occasionally use this branch as far as Waltham on the Wolds, where there is a passenger station. This line is now being extended in an easterly direction from Waltham in order to join the Great Northern main line at Highdyke, a few miles south of Grantham. At Marefield, a mile south of John o' Gaunt station, there is a triangle junction by means of which the Great Northern Leicester branch connects with the Joint Railway.

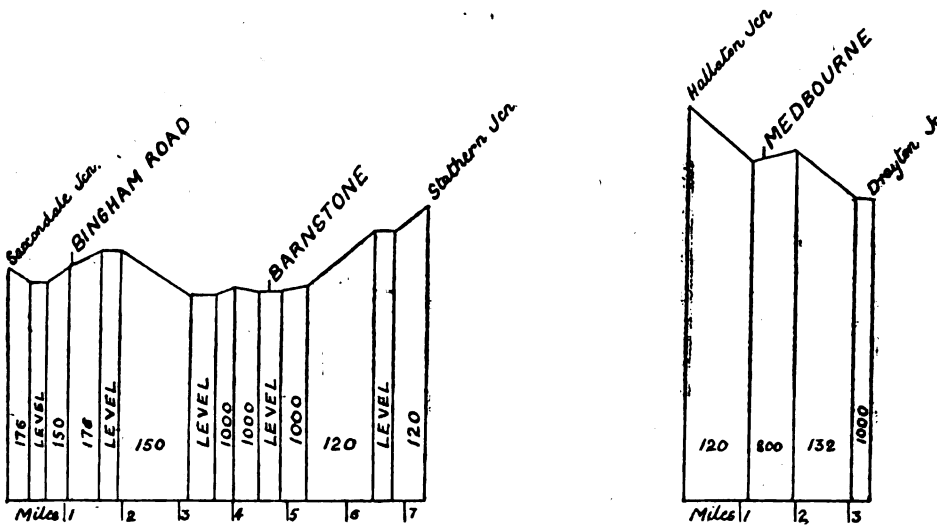
The London and North Western Railway maintains the railway between Welham Junction and Melton Mowbray (including the latter station and also the Medbourne branch) and the Great Northern Railway the portion north of Melton Mowbray, parent Companies' signals and fittings being adopted on the respective sections.

The railway passes through a district famous as being one of the greatest hunting centres in the country. There are also considerable deposits of ironstone in the neighbourhood. Redmile is the nearest station to the Duke of Rutland's seat at Belvoir Castle, whence a tramroad to the Nottingham and Grantham canal was made in 1793 and is still in use.

By means of the Joint Line, Nottingham is brought within 130¼ miles of Euston station, which distance is only 6¾ miles more than the shortest route between London and Nottingham—a fact not generally realised. For purposes of comparison, the following table of distances by the four available routes is inserted :—

	Miles.
Midland, from St. Pancras	123¼
Great Central, from Marylebone	126¼
Great Northern, from King's Cross	128¾
London and North Western, from Euston ..	130¼

In the case of Melton Mowbray, the difference is still less marked, the mileage from St. Pancras and Euston being 105¼ and 107½ respectively.



GRADIENT DIAGRAMS.

When the line was opened throughout on December 15th, 1879, there was inaugurated a passenger service of four trains a day each way between Market Harborough and Nottingham (London Road), with connections between Harby and Newark. These trains, which stopped at all stations, were provided by the parent Companies in equal proportions, *i.e.*, two each.

Starting January 1st, 1880, the Great Northern Railway ran one train a day each way between Newark and Northampton (Castle). This train left Newark at 9.30 a.m. and returned from Northampton at 3.15 p.m. It is now many years since the London and North Western Railway regularly worked passenger trains into Newark, and the same

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may be said of the Great Northern Railway as regards Market Harborough and Northampton.

On March 1st, 1880, the Great Northern Railway opened a short spur line from Bottesford East to Bottesford South and at the same time put on a service of four trains each way between Grantham and Harby to connect with Joint Line trains at the latter station.

The Leicester branch was opened for passenger traffic January 1st, 1883, and on July 2nd following, the Peterborough and Leicester service of four (afterwards reduced to three) trains in each direction was established. During the same month (July, 1883) the London and North Western Railway commenced to run through coaches between Leamington, Northampton and Scarborough, *viâ* the Joint Line and Newark.

Present day passenger services are normally worked by the parent Companies as follows :—

Great Northern—
- Leicester and Grantham.
- Leicester, Newark and the North, etc.
- Leicester and Lincolnshire.
- Peterborough and Leicester.

London and North Western—
- Nottingham, Market Harborough and the South, etc.

Dealing with these services in the order mentioned, there were in July, 1914, six trains each way between Leicester and Grantham. All of them were slow, except the 10.45 p.m. *ex*-Leicester (Saturdays excepted), which ran the 40½ miles to Grantham in 67 min. with conditional stops at Thurnby, Melton Mowbray and Harby. The Leicester–Grantham trains made use of the Joint Line as between Marefield North Junction and Bottesford South Junction. In addition to these, there were also various locals between Leicester and Newark, Harby and Tilton (Tilton trains took the south curve at Marefield Junction), and also between Grantham and Harby.

From mid-July to mid-September, a through express for Bridlington and Scarborough left Leicester at 11.45 a.m. on Thursdays, Fridays and Saturdays, and stopped at John o' Gaunt (conditionally), Melton Mowbray and Harby on the Joint Line. At Harby it attached London and North Western through Scarborough coaches which left Northampton at 11 a.m. From Harby the train ran without stop to Newark, and eventually reached Scarborough at 4.12 p.m. The corresponding up train left Scarborough at 12.18 p.m. on Fridays, Saturdays and Mondays and reached Leicester and Northampton at 4.58 and 5.40 p.m. respectively. In this case, the train did not stop between Newark and Melton Mowbray, and was due at the latter station at 4.19. Here it was divided, the Northampton coach being attached to the 3.45 p.m. *ex*-Nottingham, which on the days the Scarborough train ran, followed the latter from Harby.

From Leicester there were several through services to the Lincolnshire Coast resorts in the summer months. A Skegness and Mablethorpe (Saturdays excepted to the latter station) train left Leicester at 8.10 a.m. Its only stop on the Joint Line was at Melton Mowbray, and from there it ran through to Sleaford. On Saturdays, the Mablethorpe and Sutton-on-Sea portion ran separately, and followed the Skegness train from Leicester at 8.20 a.m., and also had similar stops. Other Skegness trains left Leicester at 1.35 p.m. on Saturdays and at 5 p.m. on Fridays, and these had an additional stop at Bottesford, where the 5 p.m. was attached to the 5.40 p.m. buffet-car express from Nottingham. Corresponding up trains, like those on the down journey, stopped on the Joint Line only at Melton Mowbray, and were due Leicester as follows :—From Mablethorpe at 7.44 p.m. (Saturdays only) and from Skegness at 7.35 p.m. (Fridays only), 7.54 (Saturdays only) and 9.32 p.m. All these trains travelled *viâ* Bottesford South Junction and took the direct line from Allington Junction to Barkston East Junction, which passes under the main line at Barkston, and thus avoided Grantham station.

Trains between Peterborough and Leicester numbered three in each direction daily. They left Peterborough at the south end of the station and ran over the main line for 1¼ miles to Fletton Junction, where they turned off on the right and, at Longville Junction, reached the London and North Western Peterborough branch. This line was made use of as far as Drayton Junction, at which point the Joint Line was gained and run over up to Marefield South Junction, where the trains again reached Great Northern territory. By this route, the distance from Peterborough to Leicester is 50¼ miles, and of this total, 13¼ miles belong to the Great Northern proper, 12¼ to the Joint Line and 24¾ to the London and North Western Railway. The average time occupied on the journey was 1 hour 50 min., and the trains stopped at all stations, except the

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7.25 p.m. *ex*-Peterborough, which usually missed three Leicester branch stations, but had conditional stops there.

For many years the question of withdrawing the Peterborough and Leicester trains was under consideration, but nothing definite in this direction was done until shortly after the outbreak of war, when one train each way was cancelled. Finally, the remainder ceased to run after Saturday, April 1st, 1916, and it is unlikely the service will be reinstated, even when conditions again become normal. The writer once made the journey from King's Cross to Leicester by this route (126½ miles), King's Cross being left at 12.30 p.m., Peterborough at 2.20 and Leicester reached at 4.10. On the return journey, he left Leicester at 5.45 p.m., and, travelling *viâ* Bottesford and Grantham, arrived King's Cross (146 miles) at 9.25 p.m.

London and North Western trains on the Joint Line still use London Road Low Level station, which was the Nottingham terminus of the Great Northern Railway until the opening, in May, 1900, of Victoria station, when all but about 10 per cent. of Great Northern trains were diverted there from London Road. Of the parent companies' routes from London to Joint Line stations, the London and North Western is the shorter one, access from King's Cross by the Great Northern Railway being only *viâ* Peterborough or Grantham.

The London and North Western service over the Joint Line comprised six trains in either direction between Market Harborough and Nottingham. One or two were semi-fasts, but they had so many conditional stops as to render them little, if any, better than the other trains, which served all stations. Through carriages for Joint Line stations left Euston at 4.30 p.m. and were due Nottingham at 8.16 p.m., which gave a 3 hours 46 min. timing between Euston and that town. This was the best service,* and might have been still better had not the train stopped at all but two of the Joint Line stations. The up through train—9 a.m. from Nottingham—was only one minute quicker than the down, being due Euston at 12.45 p.m. It missed five stations on the Joint Line, but had conditional stops at four of them. A possible cause of inconvenience, so far as the London and North Western service is concerned, is the early departures of the last trains, these normally being at 6 p.m. from Northampton to Nottingham and at 6 p.m. from Nottingham to Northampton, but earlier still during the present restrictions.

From the foregoing details of working, it will be seen that Medbourne station is served only by Great Northern Peterborough and Leicester trains, and Redmile only by Great Northern trains between Leicester and Grantham or Newark; whilst, generally speaking, Bingham Road and Barnstone are served by London and North Western trains between Nottingham and Market Harborough; but this statement needs some modification, because on Wednesdays the Great Northern Railway runs a mixed train from Melton Mowbray to Nottingham at 7.30 a.m. and on Saturdays a train from Nottingham, Victoria to Melton Mowbray at 10.30 p.m. Other Great Northern trains routed this way are the specials from Nottingham to Waltham on the Wolds, which run only during the time that Waltham Fair is held. Both Companies' trains call at stations Hallaton to Harby inclusive.

One curious result of this intricate working is, that Great Northern passenger trains do not run over the short length (33 chains) between Marefield North and South Junctions, nor between Hallaton Junction and Welham Junction; and London and North Western passenger trains do not run between Stathern Junction and Bottesford Junction. The last mentioned Company ran a regular service of goods trains to and from Doncaster by this route, but during the war such trains have been temporarily suspended. The London and North Western, however, still works a large number of coal trains from Colwick to Willesden, etc., over the Joint Railway. As regards the local "pick-up" goods trains from Colwick to Market Harborough and back, in normal times these are worked by the parent Companies alternately each year, but since 1916 the Great Northern has been the working Company.

The present war-time passenger service comprises three up and three down London and North Western trains between Nottingham and Market Harborough, and three Great Northern trains from Leicester to Grantham and back. In addition, the Great Northern continues to run the 7.30 a.m. Wednesdays only, mixed train from Melton Mowbray to Nottingham, Medbourne and Cotham stations (the latter between Newark and Bottesford) have been temporarily closed.

* A connection off the 9.20 a.m. *ex*-Euston was 9 min. quicker, but this was by a Northampton coach slipped at Blisworth, and not by a through train.

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An accident, involving the death of three persons, occurred at Melton Mowbray on July 25th, 1892. The 1.53 p.m. London and North Western train from Nottingham was approaching Melton Mowbray, and when about 600 yards north of the station, the engine, tender and whole train (consisting of eight carriages) were derailed, the engine, tender and three leading carriages being thrown down the embankment, resulting in the death of the driver, fireman and one passenger. At the time of the accident, platelayers were—unknown to the signalman—slewing the road, and it transpired that no flagman was provided to warn the driver, and the latter was therefore running at usual speed at this point. The engine concerned in this accident was No. 1165, *Vulture*, one of the 5 ft. 6 in. (old) "Precursor" 2-4-0 type, built 1878.

For many years, traffic on the Joint Line was controlled by a Joint Superintendent, with headquarters at Melton Mowbray, but this position was abolished June 30th, 1912, since when the Great Northern Divisional Superintendent at Nottingham has supervised the northern portion of the line (Saxondale and Bottesford to Melton Mowbray), and the London and North Western District Superintendent at Northampton the section south thereof. The last Superintendent of the Joint Railway was Mr. F. R. Carter, and the present Secretary is Mr. A. Smith, whose office is at Euston station.

[NOTE.—Our remarks relative to competition and competitive routes must, of course, be taken as applying to pre-war conditions.]

Enginemen's Dormitories.

AT Eastleigh for the convenience of enginemen, who by reason of their duties must from time to time sleep away from home, the London and South Western Railway has provided an admirably arranged dormitory.

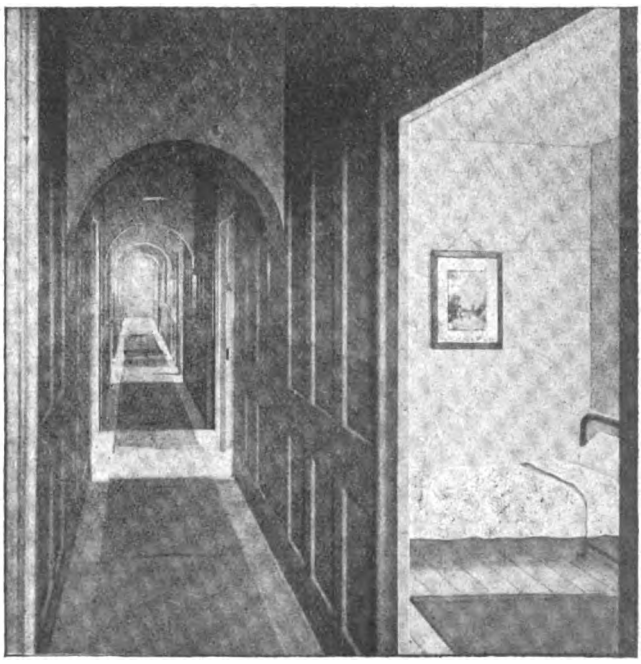
On the ground floor there is a spacious reading and dining room, also a kitchen and a box-room.

Sleeping accommodation is on the first floor, where there are 17 cubicles. At one end is the bathroom and lavatory.

A notice board downstairs provides a list of the numbers of all the cubicles with the times at which their respective occupants require to be called.

The building is electrically lighted, and everything is done to ensure the comfort of the enginemen.

Dormitories of similar construction are likewise provided by the London and South Western Railway at Salisbury and Exmouth Junction.



EASTLEIGH DORMITORY—CORRIDOR AND CUBICLE.

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London Underground Railways.

STAFF WELFARE.

LONDONERS, and visitors to the Metropolis, are well aware of the excellent facilities afforded by the management of the Underground Electric Railways, in conjunction with the London General Omnibus Company, both for inter-urban and suburban travel.

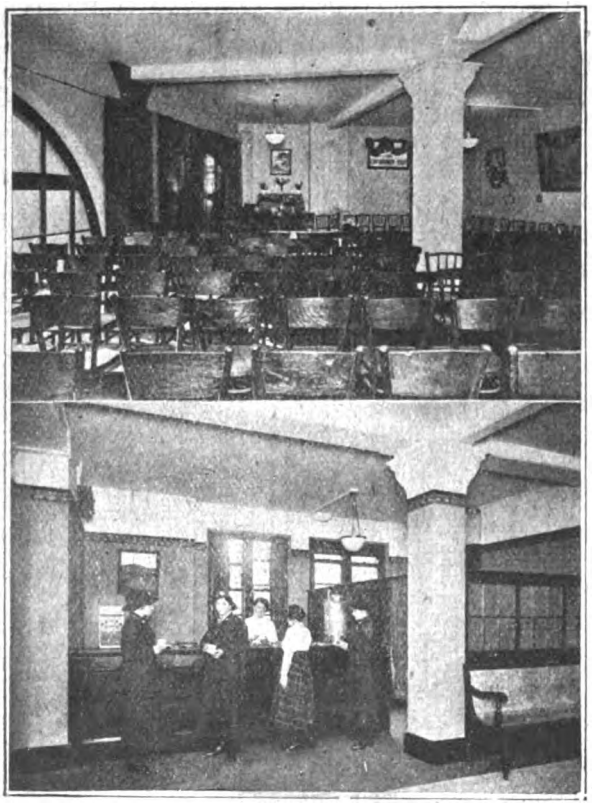
"Underground to anywhere,'
Quickest way, cheapest fare,"

is not only a jingle that has caught the popular fancy, but it is a truth that experience has hammered into millions of minds since the day the couplet was coined.

On a par with the particular care for public convenience is the paternal regard ever given by the Underground directors and chief officers to the welfare of the staff.

This admirable characteristic of the management has been noticed previously in the RAILWAY MAGAZINE, but progress on the Underground Railway shares with parliamentary politics the feature of having no finality about it, and so from time to time there is a new development—and always a highly creditable one—to record.

The latest step is a further addition to the numerous—upwards of 30 in fact—institutes and mess rooms for both the administrative and outdoor staffs of the railways and 'busses that have been provided at which opportunity is given for social recreation and the supply of meals at cost price.



RAILWAY WOMEN'S INSTITUTE, BROMPTON ROAD, W.

The top photograph illustrates the Concert Hall and the bottom one a corner of the Games and Refreshment Room.

This was accomplished by the opening by Lady Stanley on Wednesday, May 8th, 1918, of a new Women's Institute and Club over the Brompton Road station of the Piccadilly Railway, for the female booking office and uniform staffs of the Underground lines. Provision has been made for a games and refreshment room, a reading and rest room, and a spacious hall suitable for concerts, dances, meetings and similar functions, the whole suite of rooms being tastefully and suitably decorated in a plain and serviceable way consistent with "war conditions." The company has arranged for a stewardess to be in charge of the Club, and facilities are available for the supply of light refreshments, for which the staff will have to pay only the actual cost.

One of the main reasons for the provision of this Club is that many of the women staff are living in lodgings and have their homes in the country, and often at first are unaccustomed to town life. After finishing an "early turn," these girls are left to their own resources, and have no place where they can go for an hour or so for a quiet rest and a chat with colleagues. Hence, the Club should prove, among other things, a helpful channel for the staff to become better acquainted. Appreciation has been expressed by the staff for the opportunities in this direction which have been placed before them, and now that well over 1,100 women employees are on the pay roll of the Underground Railways, this new institute should be exceedingly useful to them, more especially as it is within a few minutes' walk of South Kensington station.

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The Why and the Wherefore.

Readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions of railway rolling stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o the Editor of the RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Subjects should not be of purely local interest. Before asking for information concerning railway history and the like,* RAILWAY MAGAZINE *readers should consult the pages of the "Railway Year Book," a new edition of which has just been published, price 5s. net. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use.*

Midland-London and South Western Railway through Express Services.

In the summer of 1905 an express service was instituted between Bradford, Leeds, Sheffield, Nottingham and Leicester, Midland Railway, and Southampton and Portsmouth, London and South Western Railway, *viâ* Hendon, South Acton and Richmond. The Midland Company worked the train as far as Hendon (to which point through coaches for the South Eastern and Chatham line were attached, and were taken on by a locomotive of the latter company *viâ* King's Cross and Ludgate Hill), and the London and South Western Company thence, calling at Richmond in each direction. The Bradford portion worked through to Portsmouth, being detached at Eastleigh, and the Nottingham coaches to Southampton; a restaurant car was also attached as far as Hendon. The service was withdrawn some years before the war, the South Eastern and Chatham coaches being subsequently detached from and attached to the midday Midland expresses at Kentish Town, and later worked into and out of St. Pancras.

[Reply to T. A. CORBETT.]

Lofty Viaducts.

There are probably several viaducts in this country which exceed Crumlin in the matter of maximum height above ground level, such as Barras, on the North Eastern Railway, which is a very lofty structure. But even such viaducts as these bear little comparison with those found in other parts of the world. In the south of France the rail level on the Fades viaduct of the Paris–Orleans Railway, spanning the Sionle River, is 435 ft. above the bottom of the valley (it would be possible to erect one of the cantilever towers of the Forth Bridge under the main span of this bridge and still to leave 20 ft. head-room), while the neighbouring Garabit bridge of the Midi Railway is 400 ft. high. In Burmah the Goktiek viaduct crosses a deep rift at a height of 320 ft., but at this point the Chungzoune River follows a subterranean course no less than 825 ft. below rail level. Many other noteworthy examples could be cited, did space permit.

[Reply to E. P.]

Hemel Hempstead Railway.

In 1863 and by subsequent Acts, the Hemel Hempstead Railway Company obtained powers to construct a local line, commencing at Boxmoor, on the London and North Western, and extending past Hemel Hempstead and Redbourn to Harpenden, on the Midland, and also to the Great Northern system at the same place. The prospects of this line were far from satisfactory, and the promoters found that their scheme could not be of any value unless worked by one of the larger lines. They therefore approached the Midland directors, and on July 16th, 1877, the line from the junction near Harpenden to Hemel Hempstead was opened for traffic, the railway being worked by the Midland, the communication between Boxmoor and Hemel Hempstead remaining unopened. In 1886 the owning company was dissolved and the Hemel Hempstead line became Midland Railway property.

[Reply to "HISTORICUS."]

Johnson 4-4-0 Engines, Midland Railway.

4–4–0 engines designed by Mr. S. W. Johnson on the Midland Railway are now divided into four principal classes: (*a*) the early 4–4–0 engines not yet rebuilt, now very few in number; (*b*) the same engines as rebuilt in the first instance without superheaters, subdivided into various further classes having certain external distinctions—see illustration in last January issue, page 23, and in July, 1917, pages 17 and 22; (*c*)

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the same engines as again rebuilt with superheaters—see illustration in April issue, page 252, or September, 1917, page 177; all these are numbered between 300 and 562; (*d*) the larger 4–4–0's, numbered from 700 to 779, some of which are also now superheated—see illustration in February, 1917, page 107. [Reply to J. E. ROCHE.]

4-4-0 "Renown" Class Engines, London and North Western Railway.

Above engines were 4-cylinder compounds designed by the late Mr. F. W. Webb, of both the "Jubilee" and enlarged "Alfred the Great" classes, which have now been converted to two-cylinder simples with inside cylinders 18½ in. diameter by 24 in. stroke. In external appearance they closely resemble the "Precursors," but can be distinguished by their somewhat smaller proportions, and the fact that they are all numbered in the 1900's. Some 24 of these 80 engines have now been so converted.

[Reply to "DOUBLE-HEADER."]

Caledonian Railway Locomotives of "Cardean" Class.

The only "Cardean" locomotive withdrawn from service is No. 907 (Carlisle shed), damaged in the Quintinshill accident. The others are No. 50 (named *Sir James Thompson*) at Balornock; Nos. 903 and 49 at Polmadie; Nos. 904 and 905 (Perth shed)—both were out of service for some little time last year—and No. 906 (Carlisle shed). No. 903, *Cardean*, at the time of writing is working the 3.55 p.m. up Glasgow to Carlisle express, returning to Glasgow at 11.3 p.m. Thanks for your kind wishes.

[Reply to M. W. GRIFFITHS.]

4-4-0 Locomotives.

In reference to the paragraph entitled "Which is the most powerful 4–4–0" in the April RAILWAY MAGAZINE, neither of the types cited by you are exceptional in their firebox dimensions, the class L large 4–4–0 engines on the South Eastern and Chatham Railway having a firebox heating surface of 160 sq. ft. and a fire-grate area of 22·5 sq. ft., while the corresponding figures in the case of the Drummond 463 class on the London and South Western Railway are 144 sq. ft. and 27 sq. ft. respectively.

[Reply to E. R. MASTERS.]

Foreign Railway Gauges.

See reply to Mr. J. H. Buxton concerning difference between normal British and French rail gauges. Italian State Railway gauge is 1·445 metres, and same width likewise prevails on most of the Italian private railways. In Russia the railways are mostly of 5 ft. gauge. In Holland, as in France, the rail gauge of the principal lines is 1·435 metres, which so closely approaches the British 4 ft. 8½ in. gauge that for all practical purposes it may be regarded as the same.

[Reply to J. D. REID.]

Double Chimneys on the London and North Western Railway.

The double chimney fitted to No. 1902, *Black Prince*, was removed when that engine was converted from its original 4-cylinder simple condition, as originally built, to 4-cylinder compound by Mr. Webb, uniformly with the other engines of the class. The only other engine fitted with a double chimney was the 2–4–0 "Precedent" class engine *Hampden*, which ran so equipped for a short time.

[Reply to "DOUBLE-HEADER."]

Midland and South Western Junction Railway Locomotives.

You will find the latest available information as to the locomotives on this line in the current issue of the "Railway Year Book, 1918," just published at 5s. net. Railways have been relieved by the Board of Trade from the liability of showing in the annual report the wheel arrangements of their locomotives and the numbers possessed of each type. [Reply to G. S. HARTLEY.]

0-6-0 Superheater Goods Engines, Midland Railway.

A number of engines of this type have been turned out recently from Derby Works, the present series running from 3835 to 3856, inclusive. Most of these engines are stationed at Shed 17 (Toton), and are engaged in piloting goods and mineral trains between Toton and Cricklewood.

[Reply to "QUERY."]

Railway Carriage Wheels.

British practice until recently was to employ Mansell wheels for coaches, with compressed wood centres on steel axles, encircled by steel rims with steel tyres. It is becoming increasing the practice now, however, to use wheels cast entirely from steel, or from chilled iron.

[Reply to P. W.]

Midland Railway Locomotives.

No book has been published on the locomotive history of this railway. The most

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complete record we know of the old and new numbering of Midland engines appeared in the October, November and December, 1914, issues of our contemporary, *The Locomotive.*

[Reply to H. C. CASSERLEY.]

Great Central Railway Engines.

Pollitt singles on the Great Central Railway do not work the Manchester and Liverpool expresses of the Cheshire Lines Committee, although they were seen at times on the Manchester and Southport trains until the withdrawal of that service recently.

[Reply to T. A. CORBETT.]

British Ambulance Trains in France.

Difference between the British and the French rail gauges is so slight as not to affect practical working. So far as the permanent way is concerned there is no reason why the hospital trains running in England should not be trusted on the French lines.

[Reply to J. H. BUXTON.]

Railway Reference Books.

There is no better library of railway and locomotive books than that owned by the members of the Railway Club, 92, Victoria Street, London, S.W. Become a member and you will have access to this veritable mine of information.

[Reply to "B.A.Cantab."]

Great Eastern Railway Tunnels.

No tunnel of the length you mention is to be found on the Great Eastern Railway. The longest tunnel on this railway is 1,099 yards in length, and its location is between Newmarket and Warren Hill.

[Reply to S. L. A.]

Junction Switches.

The improvement at Reading Main Junction, to which you refer, simply consisted in laying in lengthened switches, and easing the curves of the lay-out generally in order to allow of faster running over the diverging line. [Reply to D. R. HARTREE.]

Ais Gill Collision, Midland Railway, 1910.

Engines involved were Nos. 48 (2–4–0 pilot) and 549 on the express, while the light engines were Nos. 448 and 548, both of the 4–4–0 type. We are unable to trace the other numbers you require.

[Reply to S. JAMES.]

4-2-2 8 ft. "Single" Locomotives, Great Northern Railway.

We believe that there are still one or two of these famous engines in existence, but cannot say whether they are in service at the moment.

[Reply to JOHN WROTTESLEY.]

Oval Buffers.

The oval buffer is designed to prevent the buffer-locking of long vehicles when traversing sharp curves, as it affords considerably more bearing transversely than a circular buffer. [Reply to D. S. E. R.]

Midland Railway 4-6-4 Tank Engines.

Withdrawal of some of these engines from the Wellingborough–Cricklewood mineral service is probably due to the fact that they are needing repairs or refit.

[Reply to H. C. CASSERLEY.]

4-4-0 Engines, London, Brighton and South Coast Railway.

No 4–4–0 engines on this railway have been superheated, save for one experimental installation of the Phœnix superheater, since removed. [Reply to D. R. HARTREE.]

Station Lighting.

Waterloo station, London and South Western Railway, was lighted by electricity for the first time on January 7th, 1881.

[Reply to "PENSIONER."]

Tramways.

We cannot undertake street tramway queries.

[Reply to "LIVERPOOL READER."]

Most Powerful Locomotive.

See reply to "Ching" in May RAILWAY MAGAZINE. [Reply to M. D. M.]

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Derailments.

By H. C. WEBSTER, Inter. B.Sc., M.I.Loco.E.

ALTHOUGH the collision is the chief menace to the safety of our railways and accounts for the majority of casualties, derailments rank next in importance and have provided from time to time formidable instances of the damage that too frequently results from such accidents, notably, Witham, Grantham and Shrewsbury.

Generally speaking, it is difficult in cases of derailment to locate the exact cause owing to the obliteration of the traces by the disorder that results from the accident, but there are four heads or divisions under which most derailments may be roughly classed, namely, those caused by :

I. Defective permanent way.
II. Defective rolling stock.
III. Excessive speed.
IV. Negligence.

Defects in the permanent way are various and some, as in the case of the Witham disaster, might almost be classed as due to negligence. In this case it will be remembered the permanent way was under repair at the time and the opinion expressed by the Board of Trade Officer who held the enquiry was that the derailment was probably due to a weakening of the line at the knuckle timber owing to the work which was being carried out by platelayers, who had possibly exceeded the instructions of their ganger and removed fastenings which they had not time to replace before the Cromer express reached the spot.

But more usually the cause is unconnected with the "human element" and is rather of a physical nature.

The Castleton and Felling derailments, for instance, were both caused by a buckling of the road due to the expansion of the rails under the heat action of the sun.

It is universally known that expansion spaces (usually ¼ in.) are provided between each rail length for the purpose of permitting free expansion and the fish plate bolts are from time to time (especially during April and May) slacked back in order to allow for the rail movement, but nevertheless a combination of circumstances will bring about an expansion in excess of this allowance and force the road laterally out of line.

Should a line run approximately east and west, and more especially in a cutting, it will readily be seen that the power of the sun is very great, playing as it does without interruption direct upon the rail heads, the effect of the cutting being to keep off all breeze and yet to provide no shade.

This heat is frequently rendered more intense if the ballast is of a kind that radiates heat, such as ashes or granite chips.

There are other contributary causes to buckling the road, which is usually of sudden occurrence, the principal being "rail creep," in connection with which a very interesting paper was recently read before the Institute of Civil Engineers by Mr. H. P. Miles, who states that the factors tending to cause this movement are, the class of traffic that passes over the road, the gradients, alignment, and the percentage of length of straight to curve.

The ballast and sub-soil are important factors as potential causes of derailment, if the road bed is of a soft or yielding nature, or being newly laid has not properly consolidated, the whole track is inclined to rock and oscillate under the stress of passing traffic and if the sub-soil is clay, there is a spring in the road that makes it liable to become deformed.

Super-elevation on curves is of course affected by any lack of rigidity and this may be considerably lowered or even reduced to nothing if there is insufficient resistance in the road bed.

With regard to the condition of the permanent way itself, this requires constant and close scrutiny in order that it may at all times be kept in good repair and any defect or irregularity noted. The Strathaven (Caledonian Railway, January 2nd, 1906), Sunderland (North Eastern Railway, July 31st, 1909), Stafford station (London and North Western Railway, March 13th, 1906), and two derailments on the Londonderry, Lough Swilly and Letterkenny Railways in Ireland, besides many others, were all due to an imperfect track ; in the two last named cases the rails were of too light a section,

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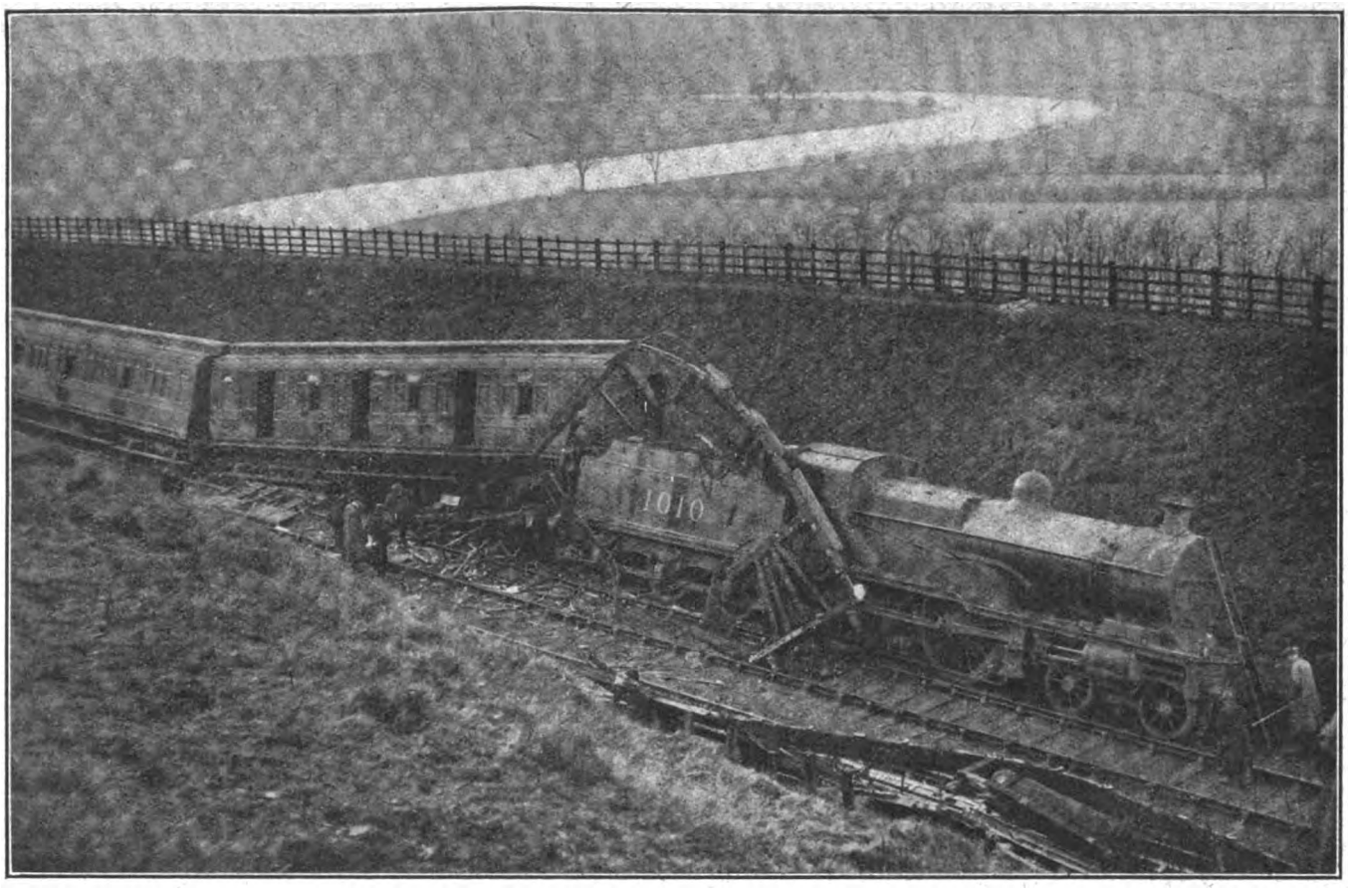

Photo] [*Topical.*

THE LANDSLIP AT LITTLE SALKELD, MIDLAND RAILWAY.

Another photograph of this derailment, on January 19th, 1918, was given on page 161, March RAILWAY MAGAZINE.
The engine is 4–4–0 compound locomotive, No. 1010.

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which was also the case in the Catesby Tunnel accident. Speaking generally, a rail should not be allowed to wear more than one tenth of its original weight before being renewed when used for main line purposes.

Defective points and crossings caused the Stafford station and Sunderland accidents, and at all times these connections are a source of anxiety. Diamond crossings when situated on a curve are especially dangerous, since there are so many factors that may cause a vehicle to take the wrong direction. High speed, or excessive oscillation, difference in the design of vehicles, improper adjustment of draw-gear or any combination of these may result in splitting the train.

Switch rails occasionally work loose and wear jointly with the fixed rail at the end that abuts against the switch heel; this renders the road at this point particularly dangerous and has been the cause of many accidents.

II.—Defective Rolling Stock.

The accident at Stoat's Nest, on the London, Brighton and South Coast Railway, is probably the best remembered of recent derailments caused by a defect or defects in the rolling stock. In this case the 3.40 p.m. express from Brighton to London, consisting of the engine, tender and ten vehicles, left the road near Stoat's Nest station whilst travelling at 45 miles an hour.

The direct cause of this accident was the shifting upon its axle by 1 in. of the left hand leading wheel of the leading bogie of the fifth vehicle, which, on reaching the crossing, was deflected as a consequence, derailing this vehicle, which in turn threw over those that followed it.

A very common trouble is the "sharp flange," which brought about, among others, the derailments at Kingstown (Dublin and South Eastern Railway) and Scotswood (North Eastern Railway) in May and October, 1911.

The flanges of locomotive and tender wheels, particularly those leading and trailing when the wheelbase is rigid, are very soon worn by the continual grinding of the flange upon the rail in its progress round curves and becomes both thin and sharp. This defect is temporarily remedied by "tooling," a process that consists of fastening a turning tool by special fixture to the engine frame (usually at the guard iron) and by moving the engine backwards and forwards to take a cut from the tyre flange and turn off the sharp edge.

Sharp flanges, besides the tendency to split facing points, are always much more likely to cause the engine to take two roads at any diamond or crossover and a close examination of the condition of the tyres is invariably the first duty of the officer who has to ascertain the cause of the derailment.

A defective spring shoe which, by its fracture, threw an excess of weight on to the other end of the axle, was the cause of the derailment at Strabane on the Midland Railway (Ireland) in March, 1916, and the same unequal distribution of load, due this time to the breaking of a spring hanger, brought about that at Scremerston on the North Eastern Railway in May, 1916, when the train was wholly derailed whilst travelling at a speed of from 50 to 60 miles an hour, whilst in the case of the Bulwell Common accident on the Great Central Railway in August, 1915, the express from Bradford to London was derailed, also at a high rate of speed, by the fracture near the wheel seat of a rear bogie axle on the sixth vehicle.

The importance will thus be seen of a thorough examination from time to time of all material used in the construction of railway rolling stock, although in most of the cases above cited the defects were not such as would have been detected by the closest scrutiny, which was pointed out at the time to the exoneration of those concerned.

III.—Excessive Speed.

In the consideration of excessive speed as a cause of derailment there are many cases where, owing to the death of those who alone could clear the matter up, the actual conditions existing at the time of the accident will probably never now be known.

The writer has in mind the disaster at Salisbury on the London and South Western Railway that happened on July 1st, 1906, and resulted in the death of 28 persons and in the injury of 11. The first cause of this derailment was the speed at which the train took the curve (70 miles per hour at the point of leaving the rails), whether this excess was the result of accident or neglect must remain a matter of conjecture.

The accidents referred to are more numerous than might be supposed; there is, for instance, the possibility of sudden illness or even death overtaking the driver unnoticed by the fireman, very likely engaged upon his own duties; again, the breaking of the gauge glass or other local explosion could injure those on the footplate

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or at all events prevent their reaching the controlling mechanism in order to stop the train.

It is, of course, upon any divergence from the straight that excessive speed has its most dire results, the process of such a derailment as that at Salisbury is that on taking the curve the engine and leading vehicles give a severe lurch to the outside rail under the combined restraint exerted on the wheels and underframes by the rail and the centrifugal force due to the speed, which, though possibly not sufficient to cause overturning, nevertheless lifts the inside wheels from the rail and renders the check rail useless when there are any points or crossings on the curve.

Consequently the outer wheels are free to diverge at the first diamond crossing that is met and the tendency to do this is increased by the high pressure between the tyre flange and rail of these outside wheels set up by the centrifugal force. On meeting such a cross-over or gap in the outside rail the engine immediately takes two roads, which has the effect of transforming its motion, no longer restrained, to one that is tangential to the curve and hence the centrifugal force vanishes, with the result that the inside wheels drop back and complete the derailment of the train.

There are other considerations that take place at the same time, as, for instance, the oscillation, springing of the road bed, and the effect upon super-elevation mentioned under Permanent Way Defects. It is in order to overcome the initial lurch that switch rails are sometimes used curved to a radius instead of straight, as is usual; this permits a more gradual transition from the straight to the curve.

Another frequent cause of derailment brought about by excessive speed is the oscillation in which it results. It is usual now to build locomotives intended for fast running with either a bogie or radial axle, which very greatly reduces the oscillation at high speed by permitting a more elastic conformation to the curvature of the road. Each diversion from the straight to a curve or *vice versa* causes the engine to lurch and sets up an oscillation that irregularity in the road may check or increase. Further, if the wheels are of small diameter they must of necessity rotate at a very high speed, with a corresponding rapid movement of reciprocating parts. Again, if the wheelbase is fixed and long there is a tendency for the leading wheel to climb the rail. All these factors render the design of the engine for its particular class of work most important.

The relative tendency to oscillate at high speed of tender and tank engines was, in the early part of 1906, the subject of close investigation among the railways and a large number of special trials were conducted with a view to discover which type of locomotive had the advantage in this respect. The results showed that a tank engine is equally as safe as a tender engine and that the latter has no superiority in point of safety provided, as already pointed out, that the design is suitable for the work upon which the locomotive is to be employed.

Turning next to the speed of goods trains, a liability to derailment here, in cases where the train is not braked throughout, is the "bunching up" of the wagons when the brake is applied to the locomotive. This is, or should be, minimised by the application of the brake in the guard's van, but nevertheless such bunching up does occur and with it the tendency for a wagon to "lift" or jump clear of the line and so bring about a derailment. Particularly is this so with light four-wheeled stock running loosely coupled.

IV.—Negligence.

With the ever-growing devices for ensuring the safe working of trains, derailments caused by the negligent operation of mechanical apparatus are comparatively rare, but do occur from time to time, as instanced by the Muirhouse Junction (Caledonian Railway), Sudbury (London and North Western Railway) and Victoria station (London, Brighton and South Coast Railway) accidents. In the two former cases the trains were derailed by a movement of the points before they had been passed over by the train, and in the last by the fact that the signalman pulled the wrong lever.

A more common defection, and possibly one that is more reprehensible, is inattention to duty on the part of the driver whilst in charge of his train.

The disaster at Shrewsbury (October 15th, 1907) was a case in illustration where, remarkable as it may seem, the driver was presumed to be asleep or at any rate dozing when approaching the station and consequently took the curve at a speed of 60 miles an hour instead of 10 as fixed by the order.

This tendency to sleep is far stronger than may be imagined, as those will know who have travelled long distances on the footplate. The oppressive heat, a sustained monotony of motion, eye strain caused by a

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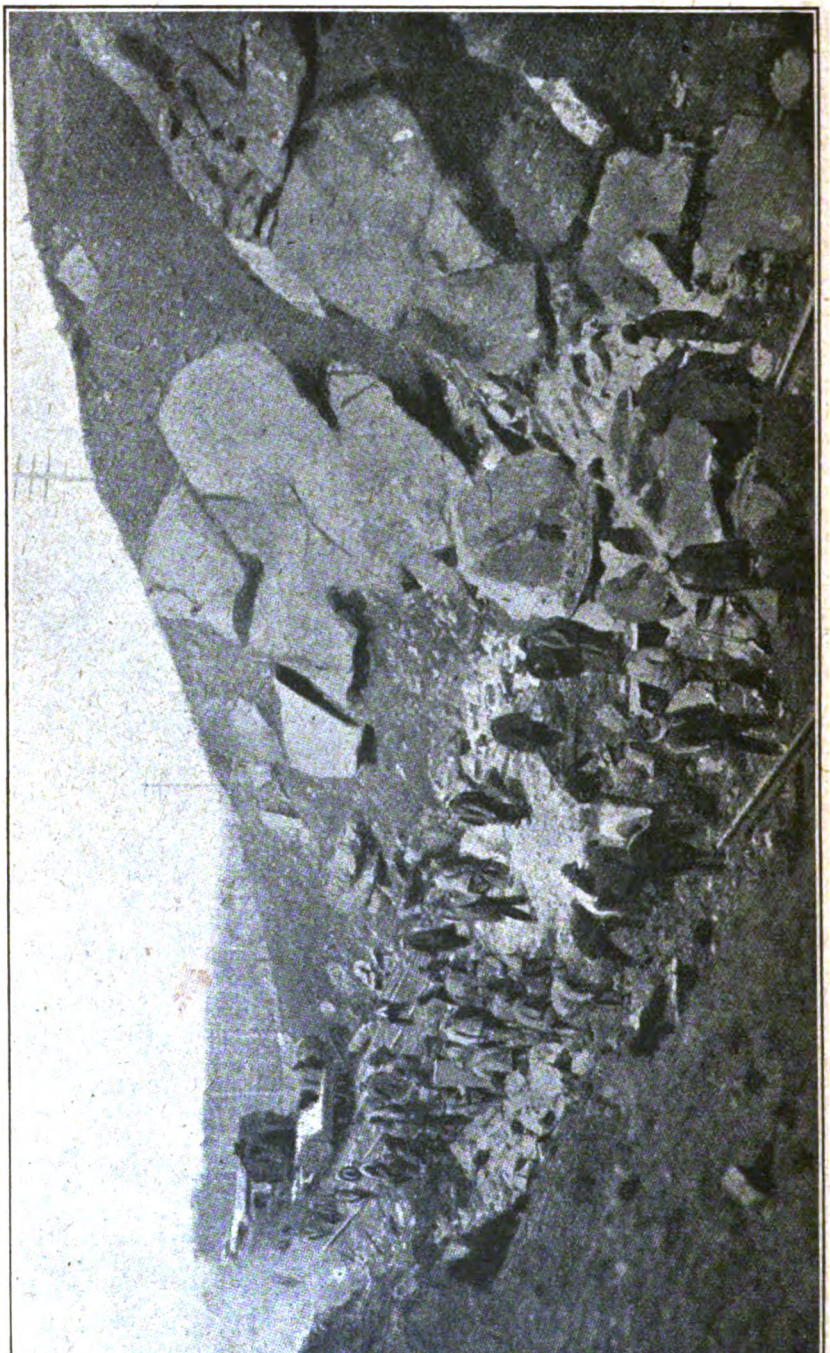

AN UNUSUAL AMERICAN DERAILMENT.
Scene of the accident at Elizabethtown, Pennsylvania Railroad, March 15th, 1918

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continued passing at high speed of stationary objects, all combine to produce drowsiness and to these must be added the lack of sleep too often experienced by enginemen who, when on night duty, obtain but an unnatural rest during the daylight hours and even at night time frequently sleep in foreign beds under foreign conditions, besides which they do not always relegate a sufficient time for resting purposes. In these circumstances a momentary dozing is by no means improbable and, as in the case of the Shrewsbury accident, the results are disastrous.

The marshalling of trains is an important factor in considering the causes of derailments and although in cases of main line and similar stock this is done when compiling the "Load List" at headquarters, it is frequently carried out by local authority, when care has to be exercised to so marshall the train that it shall be safe to travel at high speeds. For this reason a light vehicle should not be placed between two heavy or long ones, since there is a tendency for the former to be nipped and lifted when the brake is applied to the train, which may be sufficient to lift the wheels clear of the rails. Such stock should always form the rear of the train that is likely to travel at high speeds, being at all times more liable to derailment than bogie stock by reason of the rigidity and shortness of its wheelbase.

With regard to goods trains, wagon loads must be evenly distributed and not in excess of that for which the wagon was designed to carry. Unequal or excessive loading results in undue stress besides unequal pressure on the rails by the wheels and this makes it possible for any unevenness in the road to cause the wagon to cant and possibly to derail.

Such accidents as the recent derailment at Little Salkeld form a class of their own and are to an extent unavoidable, though not the less serious on that account. With this might be classed the Highland Railway accident of June, 1914, when 5 passengers were drowned and 10 injured by the collapse of an overstream bridge near Carr Bridge, and the accident on the Leven Viaduct, near Ulverston, Furness Railway, that occurred in February, 1903, when all the vehicles of a train were overturned by a hurricane of 120 miles an hour.

To supplement the foregoing article, an unusual American derailment which has occurred recently to a West-bound passenger train on the Pennsylvania Railroad, when two passengers were killed, may be mentioned.

This accident, due to the falling of a mass of rock weighing several hundred tons, occurred about 1 a.m., and most of the passengers who were injured appear to have been asleep. Of the total number of injuries, 24, a large majority is said to have been classed as not grave.

The sleeping cars which were wrecked were the "Limedale," the "Collington," and the "Irvineton.

The train was moving at about 40 or 50 miles an hour. There are at this point only two main tracks. The fall of rock, from the north, struck the side of the "Limedale," the third car in the train, overturned it, and pushed it across the south track into the ditch. The next car was partly overturned, and the next one, the fifth in the train, ran up on one of the rocks, and, although remaining upright, was inclined about 40 deg. above horizontal.

The fall of rock consisted principally of four large pieces. The heaviest weighed between 150 and 200 tons, and the smaller ones from 15 to 20 tons each. Including smaller pieces, about 600 tons fell altogether and 400 lbs. of dynamite was used in breaking up the large pieces so that they could be removed.

The body of rock which fell did not roll from the top of the cutting, but became detached from a larger body of stone, the upper part being about 27 ft. above the top of the rail. It fell over toward the track, with its base acting as a pivot. The parting of the rock is thought to have been due to the action of the extremely severe frost during the winter, followed by heavy rains a few days before the accident.

This track is patrolled by watchmen day and night, every hour, and the records of the watchman show proper performance on that night. An investigation was made by the coroner, who exonerated the company from blame.

In the first sleeping car, the "Limedale," there were 25 persons, all in their berths. The mass struck the car a glancing blow and turned it almost completely upside down. The disaster came with such appalling swiftness and surprise that the passengers were unable to describe the first shock.

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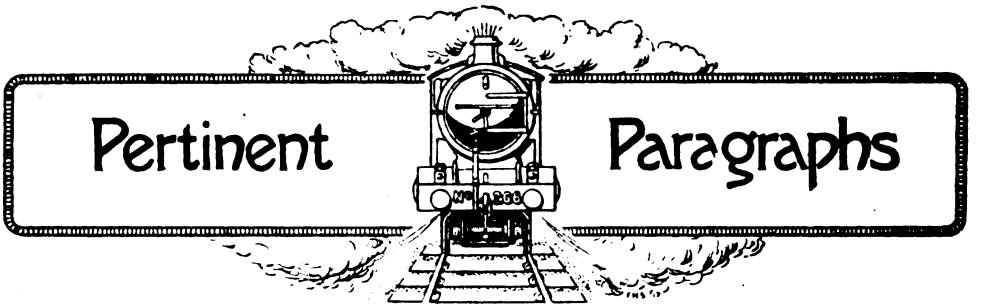

Looking Ahead.

THIS June issue of the RAILWAY MAGAZINE completes the twenty-first year of the publication of the periodical. Special steps are being taken to ensure the general attractiveness of the forthcoming July number, which will commence a new volume and will be printed on a paper of better quality than that recently available.

The July frontispiece will be a fine colour plate reproduced from an oil painting of the Great Western Railway 2–6–0 locomotive, No. 4331.

To supplement the popular standard features of the RAILWAY MAGAZINE, arrangements have been made to include in the volume commencing July, a number of authoritative articles on general railway subjects specially written by qualified experts.

Prohibition by the Paper Controller of the return of all unsold periodicals by newsagents and booksellers will make it obligatory upon those tradespeople and railway bookstall proprietors, to stock only the publications that are actually ordered by their customers, or to keep their stocks very much within their real requirements. RAILWAY MAGAZINE readers who have not already booked orders with their agents are strongly advised to do so at once, and thus avoid disappointment. Those who so desire may have the magazine posted direct from the publishing office on payment of a subscription of 6s. 9d. for six or 13s. 6d. for twelve months. If British readers would but adopt the satisfactory American system of becoming subscribers to their favourite periodical by paying in advance, the many complaints of inability of obtaining magazines because they are "sold out" would automatically disappear. Change in circumstances necessitates change in practice, and we rely upon all RAILWAY MAGAZINE readers realising, as so many already do, that it is no fault of the management if this periodical, like others, can no longer be obtained in the casual manner prevailing in pre-war days. The old style was pernicious even in peace, because it was wasteful. In war-time there must be no waste.

Train Indicator on Brighton Company's Stations.

THE great utility of the Time-table Indicator at the principal stations of the London, Brighton and South Coast Railway has been demonstrated recently. A revised service of trains came into operation on May 1st which had necessitated the alteration of over one thousand trains. This entailed enormous work to the time-table compilers and printers, and as the public were unable to secure any printed matter setting forth the detailed arrangements, owing to the dilution of labour and other difficulties, the indicators everywhere proved an immense convenience both to the public and to the railway staff. On April 30th as each hour passed the times were corrected for the following day, and thus on the morning of May 1st a revised train service was available.

The public evinced considerable interest in the operations of the staff as they effected the various changes, and were not slow to appreciate the facility, for the simple and clear way the times were presented enabled them to be easily recorded.

The Brighton Railway Company has now 105 of these indicators erected at the most important stations, and the management is to be congratulated for its foresight, the utility of which has never perhaps been so fully demonstrated or so much appreciated as in the case of recent revisions.

The indicators, which were built by Messrs. Benn & Cronin, Ltd., 11, Borough High Street, S.E.1, show the complete list of train departures on white enamelled plates, with figures varying from 1 in. to 2 in. in depth.

Post War Developments.

IN the March RAILWAY MAGAZINE a reader signing himself "H. L. L." dealt at length with some of the possible outcomes of British railway wartime working, and he ventured to predict the abandonment of the practice of "Double-heading" trains. We shall, he stated, have to follow the American example, and within a year or two of the end of the war we shall see far bigger and more powerful engines on our main lines. Our correspondent likewise advocated the use of larger goods and coal wagons. His arguments have not escaped notice on the American side of the Atlantic, and several RAILWAY MAGAZINE readers in the United States have communicated their comments.

From Taunton, Mass., Mr. Edward Crosland Taylor writes:—

"The railways here, particularly the N.Y.N.H. and H.R., the local line, got into very bad shape during the extremely cold weather, but are now recovering.

"In connection with the controversy, I notice in your columns about the economy or otherwise

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of 'Double-heading' (as we call it) on goods trains, many lines in this country are handicapped by having provided nothing but very large freight engines, which are frequently to be seen pulling trains much too light for them; the local line are fortunate in this respect, having inherited a number of smaller engines which are of great use to them on their branches and minor lines, on the trains of limited weight which serve the district.

"Double-heading is frequently to be seen on the N.Y.N.H.H.R., a strange feature being that in many cases, apparently in order to distribute the weight when passing over bridges, the engines are separated by from six to twelve freight cars.

"Two of the smaller freight engines will take a train of 80 cars, all trains being mixed loaded and light cars together.

"The old standard goods had a tractive power of 30,223 lbs., whilst the new 2–8–2 machines have a tractive power of 45,500 lbs.; the comparative weights of the engines were 67 and 112 English tons respectively.

"However, they have found that the tenders of the new large engines when swinging over a cross-over, foul any third track which may be alongside, if there are any vehicles on it, so that they are restricted to the main line between Boston and New York and are not used round here. To get over this difficulty, the heaviest goods trains through Taunton are handled by the first-class main line passenger engines of the 4–6–2 type, which are lighter and have smaller tenders; the great trouble with these large and long engines is that they are too big for the existing accommodation at engine sheds along the line. It is very impressive to stand at ground level alongside of one."

Another American reader, who writes from Tellico Plains, Tenn., and signs himself "C. S. S.," remarks:—

"After the war, the question of higher wages for railwaymen will have to be met, and increased efficiency in working or higher goods rates are the only answers. Larger trucks or freight cars, say 30 English tons, would undoubtedly effect a great saving in dead weight hauled, in number of train miles, in trackage, and to a smaller degree in man power. The introduction of large cars would, however, be troublesome and expensive. Three radical changes are necessary: 1st, central buffers; 2nd, continuous brakes; 3rd, an increase of the train crew. As to the third requirement, heavy trains frequently break in two, and one man could not look after them. Furthermore, a 30-ton car cannot be shunted like a 10-ton car, and a skilled man must ride and control a heavy truck when being shunted. The station staffs could probably be reduced to offset the extra train crew. After the war would seem to be the time to begin the change, when rolling stock is short and in need of renewal. I do not think there is any question as to the merits of large trucks and heavy trains as against small trucks and light trains. The only question is whether the change justifies the trouble and expense necessary to effect it."

Institution of Locomotive Engineers.

On Saturday, May 11th, Mr. H. N. Gresley, Chief Locomotive Engineer, Great Northern Railway, gave his inaugural address on his appointment as Chairman of the Northern Centre of the Institution of Locomotive Engineers. The meeting was held at the Philosophical Hall, Park Row, Leeds. By a mischance, Mr. Gresley was, on page 346 of the May Railway Magazine, referred to as though he had been made chairman of the institution as a whole, instead of the Leeds Centre only. The President of the Institution is Mr. A. D. Jones, O.B.E., M.I.Mech.E., Outdoor Locomotive and Carriage Superintendent, South Eastern and Chatham Railway. The Hon. Sec. for the Northern Centre is Mr. A. T. Houldcroft, Leeds Forge, Leeds.

MR. A. D. JONES, O.B.E.,
President of the Institution of Locomotive Engineers.
Outdoor Locomotive Superintendent, South Eastern and Chatham Railway.

Bury and Holcombe Brook Line: Provision of Live Rail.

In connection with the Bury and Holcombe Brook section of the Lancashire and Yorkshire Railway, an extension of the live rail from the Manchester and Bury section has just been completed.

This section was previously operated from an overhead trolley line, but in order to carry out efficient working, and to enable through cars to be run from Manchester to Holcombe Brook, this extension became necessary.

The live rail is the "side-contact" type, similar to that used on the Manchester and Bury line, and invented by Sir John A. F. Aspinall, the General Manager of the Lancashire and

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Yorkshire Railway Company. It is directly connected to the Manchester and Bury live rail at Bury, and supplies current at 1,200 volts direct current to the trains. The live rail is completely protected by guard boards made of jarrah. The return current is taken by the running rails, which are bonded at the joints and cross-bonded at every 100 yards; the service on this section not being heavy enough to warrant a fourth rail being installed. The live rail is divided into sections which are connected up through section switches situated on the side of the line, and these switches are operated as ordinary hook switches. The gaps in the live rail at crossings, etc., are connected by bitumen insulated cable, and all cables are carried above ground where possible, but where underground work is necessary, "Howard" troughing is used.

This conversion to 1,200 volts came into operation on March 29th, 1918.

The distance between Bury and Holcombe Brook is five miles, and part of the line is single track.

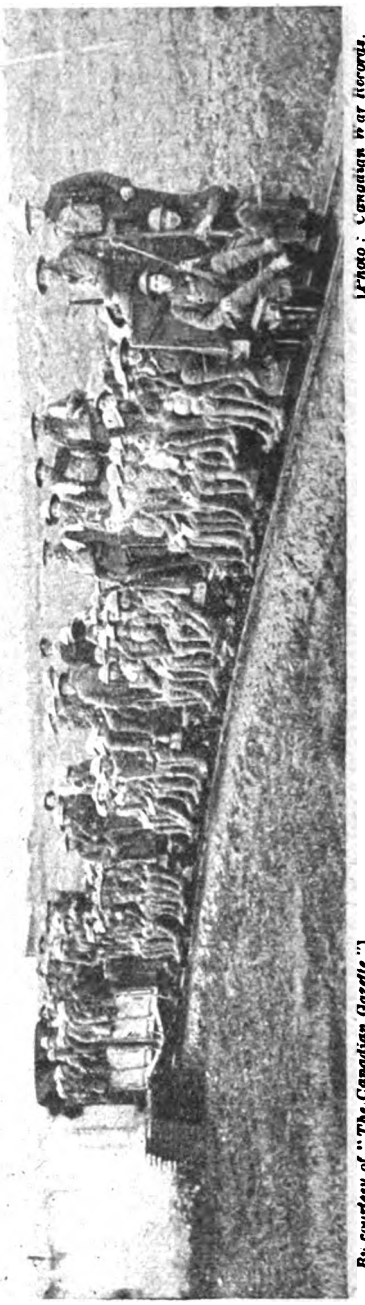
Canadian Railway Construction Corps in France.

"KEEP the lines clear, save the big guns; then destroy everything." These were, writes Mr. W. A. Willison, the orders that a Canadian Overseas Railway Construction Unit got when the Hun's great attack on the Somme was well launched and the front trench line had in places been driven in, and how well they carried them out is confirmed in a message of congratulation from their army commander and the awards of one D.S.O., two M.C.'s, one D.C.M., and nineteen Military Medals.

The corps headquarters were at Bihucourt when the storm broke. From Boisleux to Achiet, Fremicourt to Velu and St. Leger, these railway experts, the first to come over from Canada, kept the lines open under a storm of shell fire. The big guns stayed confidently until the last minute, knowing the shell-broken line behind them would be mended by the Canadian engineers in time to get away. In every case there was the engine with its Canadian crew ready to draw the monster gun to safety, and not a single one was lost, although there were many narrow escapes.

Take the report of a young officer who was responsible for the section near Velu, north-east of Bapaume. Some heavy howitzer batteries there were working feverishly to retard the German advance over the Nord Canal. "Brought up three trucks of ammunition and kept track open from Ypres to Velu. Mended eight bad breaks between eight and ten-thirty"—this was March 21st—"then shifted the howitzers back to Fremicourt." That meant three trips over the hastily mended line, through heavy shell fire, with 50-ton trucks, which once ditched could hardly have been got on the track again in time to be saved.

On the second day of the attack Bihucourt became too hot for the Canadian engineers, and it was decided to abandon camp. Back to Miraumont went the whole establishment, and for the rest of the day they worked their steam shovel getting out ballast to use on the broken lines. In spite of intense shelling they managed



[Photo: Canadian War Records.

ONE OF THE CANADIAN LIGHT RAILWAYS IN FRANCE
The trucks have been captured from the Germans

By courtesy of "The Canadian Gazette."]

to load up over a thousand tons, which they found of priceless value later in their adventures.

Working amongst the retiring troops and with the railway lines crowded with traffic up to the

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last minute, the work of destroying the yards and systems that might be of use to the Huns was a delicate task. Sometimes the engineers had to wait at a budge, with explosive charges laid, until the last of the light guns or fighting soldiers came across, then blow up the structure while Boche machine-guns played on them.

Every known heavy gun in that district was got out on the night of March 22nd, and then the real work of destruction began. The old French main line from Arras to Albert was blown up in ten places. Two culverts and three bridges were destroyed. The big yard at Athiet le Grand, one of the largest railway centres near the front, was laid waste. By three o'clock on the afternoon of March 25th they were able to report that area as "complete."

Another young officer with another convoy of explosive had a similar experience. His tally on March 25th was five bridges on the Albert to Arras railway, the burning up of a large timber dump in Miraumont, and the overhead bridge at Aveluy. The same afternoon another party of the Overseas Construction men heard that a section of standard gauge track from Beaulencourt, south of Bapaume, to Miraumont had been missed, and carrying ammonal tubes on their shoulders they went into the thick of the battle, knowing full well that the Huns were behind them in some places. They never returned, but their colonel is proudly certain that the section was destroyed.

An Engine Driver's War-Time Experiences in Bavaria.

An engineman attached to the Bavarian State Railways writes to the *Bayerische Landeszeitung*, giving his experiences at the present time, showing the state of affairs arising out of the war conditions. The following are the most notable passages of his illuminating account:—

"Attention has been called to the intolerable delays in the train service on the Bavarian lines. At the present time it has become a 'Russian' chaos. Passenger trains are frequently five or six hours late, and goods trains are anything from 10 to 24 hours behind time. Frequent change of engines are necessitated by burst tubes, and the hours of the staff are protracted enormously.

"Owing to the delays, engines are kept constantly under steam, and we never know when we get home, as there are not sufficient men to relieve us.

"One of the principal causes of the delays is the want of proper lubricants. The English have stopped our supplies from Texas and the South Russian oils are not forthcoming. Consequently we have to fall back on tar-oils, with a low flash-point. The wagons are not properly greased, hot boxes are the order of the day, and piston and coupling rods are constantly giving out. Our splendid shops at Munich are below their usual output owing to want of fitters.

"Another cause of failure is the use of steel fireboxes. In the old days we had cause to be satisfied with the provision of copper boxes, but the war absorbs all: no bell is too high and no kitchen too aristocratic for its greedy hands. Now they are taking the copper fireboxes to make projectiles. With these steel boxes we have to reduce the pressure and more water is consumed.

"It is the same story as regards coal. We always had bad fuel in Bavaria. Now it is far worse. When I was on the express service before the war I had an engine of the S 3/6 type. For the run from Nuremburg to Wurzburg and back, a distance of 200 km. (125 miles) we used to burn 40 to 45 quintals (4 to 4½ short tons). Now we have to consume 180 quintals (18 short tons) for the same distance. (Note. This comparison is of not much value, because the time taken at the present period is far greater than in peace time.) We often have to stop five or six times on the run to raise steam, and meanwhile we are blocking the road for other trains following.

"The congestion in the running sheds is enormous, the engines are all out of turn and are never ready to take their trains. If they are ready, they generally break down at the next station, because they have not been properly examined. The amount of clinker which has accumulated prevents any circulation between the roads, and engines cannot get to the pits.

"The gentlemen sitting in their offices do not realise what the delays are. Engines are kept waiting three or four hours outside the pits or coal stages for their turn. Sometimes we arrive so late that there is no time to get food and have to leave again with food only half eaten. The service at present is h——l, and goodness knows we try to do our best. Look at the number of sick; at Munich 72 drivers and firemen, at Nuremburg 70, at Rosenheim 35. No wonder, when we are on duty for 24 to 35 hours at a stretch and sometimes six to seven nights running. No munition worker has to put up with that! When you ask for relief after a particularly bad turn, you are told: 'No one to send.'

"One reads in the press of frequent accidents and collisions, but one does not feel surprised when you consider the mal-nutrition of the present day. The degree of mental activity is lowered, added to the fact that the attention of the driver is devoted to possible failures, due to the dreadful state of the engines.

"Frequently signal lights are not burning owing to the inferior quality of the oil in the lamps.

"The condition of things in Bavaria makes one think that we have been obliged to send more than our share of men to work in the conquered territories. The demand for skilled labour in the press advertisements shows that the men have been taken away out of proportion to the needs of the country. What we want is schools for the training of mechanics. They have them in Saxony and Baden. Nothing has been done, so far, in Bavaria."

The above article appeared in the Bavarian newspaper on January 29th last, when the conditions were doubtless very severe owing to the winter hardships prevailing. On February 7th

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the finances of the Bavarian State Railways were discussed in the Diet, but it does not appear that the distress of the railwaymen was under consideration. The minister, in his statement, said that they were paying the staff nearly two millions more in wages and that the rates of pay would shortly have to be increased again. They also gave the staff gifts of food and clothing. The question of distress, nor, indeed, any praise of the staff, finds no place in the ministerial statement.

State Control of Railways.

On the Board of Trade vote in Committee of Supply, Sir Albert Stanley, President of the Board of Trade, in his recent speech in the House of Commons, dealt first of all with the railways. The railways of Great Britain were the first large undertaking to be brought under control by the State. That control had been thoroughly satisfactory. It had been possible through this unified system to operate the railways as a single unit, thereby securing the maximum of efficiency and making substantial economies in connection with the operation of the lines.

There was a common use of railway-owned rolling stock, and to a very considerable extent traders' wagons were used for the general trade of the war.

It was now a common practice to operate very much heavier trains, and the loading of wagons was very much heavier than it was prior to the war. The traffic on the railways, both of goods and passengers, was heavier than at any time in the history of railways. Not only was it heavier, but they had to bear in mind that rolling stock had decreased, and that there was less equipment to operate railways than ever before.

Hundreds of locomotives and thousands of railway wagons had gone to France, and to-day they had lying idle, owing to lack of repairing material and labour, several thousand locomotives.

It was impossible to say exactly how the bargain was entered into between the railways and the Government was working, but he thought a careful calculation would show a loss to the State. The economies effected up to the present had only been possible through having a unified system of control, but there were still economies which might be made through a standardisation of equipment and of permanent way.

It would be a great pity if they were not to secure permanently in the interest of traders and others using the railways of the country the benefits of some system of control.

Two things might happen to the railways after the war. They would be faced with a far higher rate of wage, and they would not have the same facilities for securing labour. This question of the future of the railways was engaging the very careful attention of the Government.

Restrictions on Season Tickets.

Sir Albert Stanley denied that the railway restrictions on season tickets were intended to secure a reduction of 40 per cent. in the passenger train mile.

This was only to secure a small portion of that reduction.

The proposal to increase the price of season tickets by 10 per cent. within a radius of 10 miles and to add 10 per cent. on season tickets for journeys beyond that distance was intended to apply to the whole of Great Britain.

The number of season tickets issued, compared with last year, had increased by more than 30 per cent.

The average cost per mile was less than ·4 of a penny per mile, and when the increase was made it would be considerably less than ½d. per mile.

The increased prices would apply to all season tickets in issue when they came up for renewal and to all season tickets to be issued in future.

The season ticket traffic was being carried on by the railways at a loss. To-day the cost of operating a railway was totally different from what it was four or five years ago. The annual cost for increased wages due to bonuses was, roundly speaking, 47 millions a year.

Liverpool Street and the Post Office Tube.

Mr. J. H. Oakley (of Daniel Smith, Oakley & Garrard), as arbitrator, has announced his award in the claim by the Great Eastern Railway for £33,393 compensation from the Postmaster-General by reason of the taking of so much of the sub-soil as is required for the Post Office Tube Railway at Liverpool Street station, and for injurious affection to adjoining lands by the carrying out of such works. The case was dealt with on page 346 of the May, Railway Magazine.

The arbitrator says: "I award and determine that the sum of £6,884 be paid by the Postmaster-General to the company for the acquisition of such easement or right of user of the sub-soil of the land of the Great Eastern Railway, and that a further sum of £2,680 be paid by the Postmaster-General for or in respect of damage to be sustained by the company by reason of the severance of the said lands of the company or otherwise injuriously affecting the said lands by the exercise by the Postmaster-General of the powers conferred on him by the Post Office (London Railway) Act, 1913, or the statutory provisions incorporated therewith."

A Railway Flag Day.

His Royal Highness the Prince of Wales has become the President of the Railway Benevolent Institution for the current year, and to mark that event, together with the Diamond Jubilee of the Institution, railwaymen all over England and Wales are organising a Flag Day for Tuesday, June 11th. The Metropolitan Railway are looking after the arrangements in the localities in which

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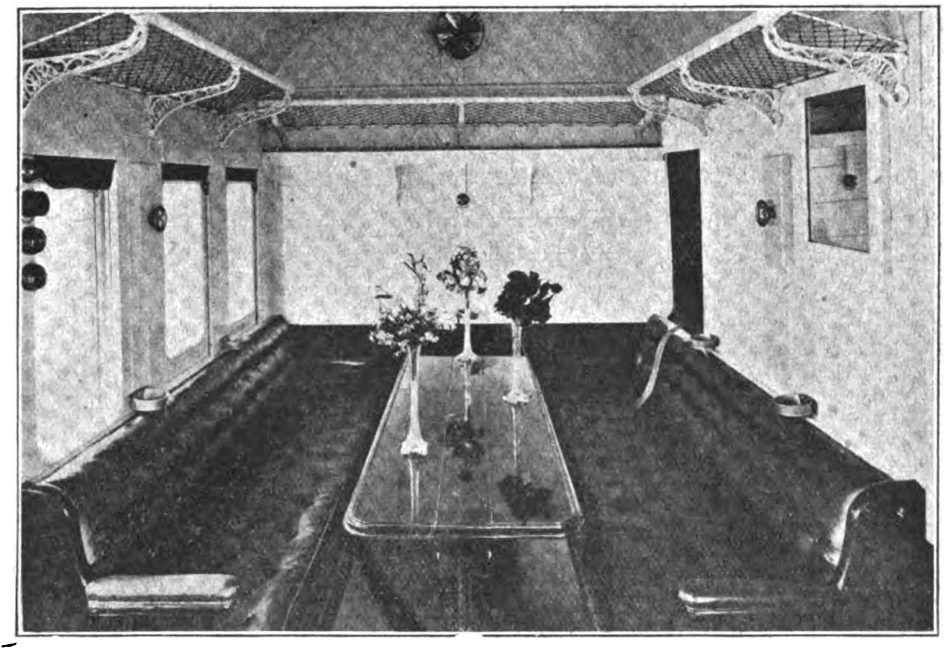

GREAT WESTERN RAILWAY AMBULANCE TRAIN FOR U.S.A. TROOPS IN EUROPE.
Sick officers' compartment.

they have stations, and the other railways are acting in a similar manner in their districts.

The Institution is maintained by contributions made by the railway companies and their officials and staffs, together with gifts received from generous members of the travelling public. The strain on its funds in consequence of war conditions is very great, and when it is mentioned that £62,000 was spent last year in maintaining a large orphanage at Derby for the children of railwaymen, in helping aged and infirm railwaymen and their wives, and in looking after them in a hundred and one ways, it will be realised that the needs of the Institution are great and pressing.

To the vigilance and care exercised by railwaymen of every grade many of us owe our safety from day to day and it is hoped that Tuesday, June 11th, will be a veritable red letter day in the finances of the Railway Benevolent Institution, enabling it to weather the storms of another year and ever increase in usefulness.

DON'T FORGET
YOUR FRIEND
IN THE FORCES.
SEND HIM A
RAILWAY MAGAZINE.

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WHAT THE RAILWAYS ARE DOING.

MAJOR ARTHUR WATSON, C.B.E., has been appointed by the directors of the Lancashire and Yorkshire Railway Assistant General Manager. He retains, we understand, his position of Superintendent of the Line. Born in Manchester, 1873, Major Watson was educated at the Manchester Grammar School and Victoria University, Manchester. In 1890 he was articled as a Civil Engineer to the Chief Engineer of the Lancashire and Yorkshire Railway, and during 1893–1897 served as Assistant Resident Engineer on railway works. During the years 1897–1900 he was Divisional Engineer for maintenance, and from 1900 to 1905 Resident Engineer in charge of extensive railway construction works. He was appointed Chief Assistant Engineer to the company in 1905, holding that position until becoming Superintendent of the Line in 1911. During 1910 he attended the International Railway Congress at Berne, Switzerland, and in 1912 visited the United States and Canada on behalf of the Company to inquire into railway practice. In 1914 he was elected a member of the Railway Executive Committee, and granted a commission as Major in the Railway Engineer and Staff Corps, Major Watson is a member of the Institution of Civil Engineers. In 1915 he was elected Chairman of the Superintendents' Conference of the Railway Clearing House, and re-elected for the years 1916, 1917 and 1918. The distinction of Commander of the Order of the British Empire was conferred on Major Watson by the King in August, 1917. His appointment as Assistant General Manager dates from May 1st. His portrait appears on page 891.

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MR. P. A. ANTHONY, C.M.G., General Manager, Federated Malay States Railways.

MR. P. A. ANTHONY, C.M.G., General Manager of the Federated Malay States Railways, who was one of the recipients of New Year's Honours this year, has been selected to report on the working of the South Australian Government Railways. It is worthy of record that Mr. Anthony, who was articled in 1890 to the late Sir James C. Inglis, is a former Great Western Railway man. In 1892 he was placed on the engineering staff at Paddington, and after three years in the drawing office and two years as Resident Engineer on new works near Plymouth, he was in 1897 appointed Resident Engineer on the new lines, etc., forming the new route to the west. These works were brought to a successful conclusion in 1906, in which year Mr. Anthony was made Chief Assistant to the Divisional Engineer at Bristol. This post he vacated in 1910 in order to take up his appointment in the Malay States. During his tenure of office in the Malay Peninsula a progressive policy of railway extension has been steadily pursued, which, in spite of the war, has been retarded only by the difficulty of obtaining supplies of ironwork from the United Kingdom. Amongst the most important of these works are the extensions northward of the Federated Malay States Railways through the western States of Kedah and Perlis to connect with the southern extension of the Siamese State Railway. Only last year Mr. Anthony, accompanied by some members of his staff and Mr. H. Gittins, the Chief Engineer of the Siamese State Railway, successfully made the journey by train from Bangkok to Prai on the mainland, opposite the island of Penang, but the connecting lines of the two Governments have not yet been fully opened for general public traffic. In view of the present importance of the question of train ferries, it is interesting to record that a wagon-ferry has been in existence for many years between the Malay Peninsula and the Island of Singapore, which lies to the south.

* * * *

MR. WILLIAM WHITELAW has resigned his seat on the directorate of the Highland Railway and Mr. A. Gregor Dixon, of Glentulchan, Glenalmond, and Major A. D. MacKinnon, C.M.G., Inverness, have been appointed directors. Mr. Whitelaw by his resignation severs a connection with the Highland Railway

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of nearly 20 years' standing. Mr. Whitelaw joined the board in October, 1898, at the age of 31, and was elected Deputy-Chairman in April, 1900, succeeding shortly afterwards to the chairmanship. He remained Chairman until March, 1912, when, in view of his increasing responsibilities as Chairman of the North British Railway (to which position he had been elected at about the same time), he found it impossible to continue to discharge the duties of the chairmanship of the Highland Railway. The directors thereupon elected Mr. R. M. Wilson (the then Deputy-Chairman) to the chairmanship, Mr. Whitelaw himself becoming Deputy-Chairman. In consequence of Mr. Wilson's breakdown in health in 1915, Mr. Whitelaw, in November, 1915, at the request of his colleagues, temporarily resumed the chairmanship of the Highland Railway for a few months. Mr. A. E. Pullar was at the same time elected Deputy-Chairman of the Highland Railway. Mr. Whitelaw retired again from the chairmanship, but not from the board, in March, 1916, when Mr. W. H. Cox was elected Chairman.

* * *

MANY RAILWAY MAGAZINE readers will regret the death of Sec.-Lieut. Charles Albert Bolter, Machine Gun Corps, son of Mr. A. E. Bolter, Secretary of the Great Western Railway, killed in action. He was educated at St. Paul's School. Keenly interested in the school games, he became captain of the cricket eleven. He took up law as his profession, and was articled to Lydall and

THE LATE 2ND LIEUT. C. A. BOLTER,
Great Western Railway.

Sons, John Street, Bedford Row, being admitted a solicitor in 1911. In the same year he joined the service of the Great Western Railway on the staff of the solicitor, his work being more particularly associated with the Parliamentary department. Immediately after the outbreak of war he enlisted in the Artists' Rifles, and was drafted to France in January, 1915. After serving with his regiment for some months, he was appointed a sergeant-instructor in the Machine Gun School in France, where he remained until he returned home to take up a commission in the Machine Gun Corps, to which he was gazetted in April, 1917. He was drafted to France again towards the end of the year. Sec.-Lieut. Bolter was in his thirty-second year.

* * *

MR. J. H. THOMAS, M.P., addressing a meeting at Derby, stated that the wage bill for British railway workers to-day was 47 millions more than in 1914, in which year the net profits of our railways were 44 millions. Before the war he believed that private ownership of railways was wrong, and he then preferred State ownership, but now they were faced with a new problem, and he would not be one to impose on the State a burden which might prove a white elephant for all time. They had to make up their minds what they meant by the demand for a share in management and control of railways. Did they want to put some of their men on the directorate? He did not believe in that. He thought Boards of Directors were obsolete and ought to be swept out of existence. The problem was not so easy as it appeared on paper, but it was capable of solution, and organisation was most important. In reply to questions, Mr. Thomas said that the average rise in railway employees' wages in Great Britain since 1914 was 25s. a week. He had not stated that he would not support State ownership of railways. He had only pointed out the financial difficulty; he could not now pledge himself, as he was a member of the Government Committee which was investigating the Acts.

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MR. F. C. SALTER, European Traffic Manager, Grand Trunk Railway, left London early in May on a short visit to Canada. It is nearly four years since he had last visited the Dominion.

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FOR a long course of years the Cambridge division of the Great Eastern Railway Ambulance Corps has carried on a creditable and useful career. Its present-day vitality and the keenness of the members were amply demonstrated at the annual meeting recently held in the Ambulance Hall under the chairmanship of Mr. E. Robinson, Divisional Commercial Superintendent, the popular president. Mr. Robinson was supported by Mr. A. C. Hutcherson; Mr. C. Slatter, Divisional Electrical Engineer; Mr. W. Pollock, Divisional Mechanical Engineer; Mr. Peacocke, stationmaster; Messrs. A. W. Paige, J. Tyler, W. L. Briggs; Police Inspector Buck; Mr. A. Bishop, Hon. Secretary; Mr. W. Burn, Hon. Treasurer, and many other members. The Secretary presented his report, showing 16 members who went in for the examination, all passed same, also that during the year 162 cases of accident had received first aid from members of the Cambridge Corps. A corps had also been

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established for the female employees, which had been very successful. Lectures had been well attended, and nine out of thirteen had passed the examination. The report was passed, likewise the balance sheet presented by the treasurer, Mr. Burns, which showed a small credit balance. Mr. E. Robinson was unanimously re-elected President, and the following elected as Vice-Presidents :—The Mayor of Cambridge (Rev. Dr. Peace), Lieut.-Col. Beales, Ald. W. H. Frances, Ald. G. Stace, Dr. H. B. Roderick, Councillor G. Lunn, Messrs. A. C. Hutcherson, H. Sherlock, J. S. Fitzjohn, C. Slatter, W. Pollock, A. W. Paige, J. Tyler, J. Wheaton, G. Flavill, J. S. Billinger, F. J. Cook, F. C. Hayward, T. R. Buck, A. German, W. G. Hewes, A. Peacocke, Boyden, Miss Monk and Mrs. J. S. Fitzjohn. Dr. Apthorpe Webb was re-elected Hon. Surgeon, and as he is on active service, Dr. W. Lawton elected as Surgeon *pro tem.* Mr. C. Munden as First Officer, Mr. A. Bishop as Secretary, Mr. W. Burn, Treasurer, and Mr. C. Smith as Inspector of Material, were also re-elected, and the following were elected as Committee: Messrs. W. L. Briggs, H. D. Hutcherson, J. F. Lawrence, W. H. French, H. Gill, H. Pamplin, A. E. Rich; and as Auditors, Messrs. S. Hiner and A. D. Amey. The certificates and labels to those successful in the January examinations were presented by Mr. E. Robinson, and a hearty vote of thanks to that gentleman for presiding and to the Secretary for the time and attention given by him to the corps terminated the proceedings.

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AT the last annual meeting of the proprietors of the London, Brighton and South Coast Railway, the Chairman, Lord Beasborough, referred to an arrangement which has been made for the staff to use plots of land along the railway for the production of vegetables. The total number of plots let at the present time amounts to about 4,000, which represents a total of 200 acres, many of which are being cultivated by the wives and children of men on naval-military service. To assist the holders of these special war allotments, a copy of the pamphlet "How to Manage an Allotment," issued by the Board of Agriculture and Fisheries, has been sent. The Company have a series of forty-three pamphlets for free distribution to applicants. These pamphlets are obtainable at the following stations: Dorking, Horsham, Pulborough, Midhurst, Chichester, East Grinstead, Tunbridge Wells, Steyning, Hayward's Heath, Lewes, Hailsham, and also from the Publicity Department, London Bridge terminus. These are convenient centres for covering the whole of the Brighton Railway system. Posters have been issued to all stations directing attention to these pamphlets, and it is hoped that very useful information will get into the hands of many persons who hitherto have not been able to secure the same.

Photo. [*Chas. S. Lake.*

LOCOMOTIVE BUILT AT DERBY WORKS FOR THE SOMERSET AND DORSET JOINT RAILWAY, HAULING A COAL TRAIN ON THE MIDLAND RAILWAY MAIN LINE.

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In regard to the exemption of certain railwaymen from military service, the Parliamentary Secretary to the Ministry of National Service recently in the House of Commons said :—All railwaymen are protected from military service under arrangements originally made between the War Office and the Railway Executive Committee and continued by the Ministry of National Service. The release of railway servants for military service is carried out under the instructions of the Railway Executive Committee and in agreement with the men's representatives. By this agreement men are released in order of medical grade, age, martial conditions, and number of children. Any man considering himself to be released out of his turn has the right of appeal to an independent committee appointed by the Board of Trade, presided over by Mr. Courthope Munro, K.C., and accepted by the Railway Executive Committee and the men's unions. Railwaymen have the same rights of appeal to tribunals on other than occupational grounds as are enjoyed by other men.

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In the House of Lords, Lord Lamington asked the Government whether, in view of the fresh restrictions which the Board of Trade are imposing on railway travelling, sleeping coaches should no longer run, so that a more equitable amount of accommodation might be provided for the general public. Lord Stanmore (Lord in Waiting) said the number of sleeping cars had been steadily reduced, and might, when the new restrictions came into force, be still further reduced. The railways were of opinion, and the Board of Trade agreed, that it was very desirable to keep a few sleeping cars running. They were largely used by officers and other persons doing Government work. Lord Lamington said he thought it was grossly unfair that because people were officials they should be allowed this luxury and that other people should be put to extreme discomfort. Lord Stanmore added that the Board of Trade were endeavouring to obtain all information on the subject of the railway arrangements generally.

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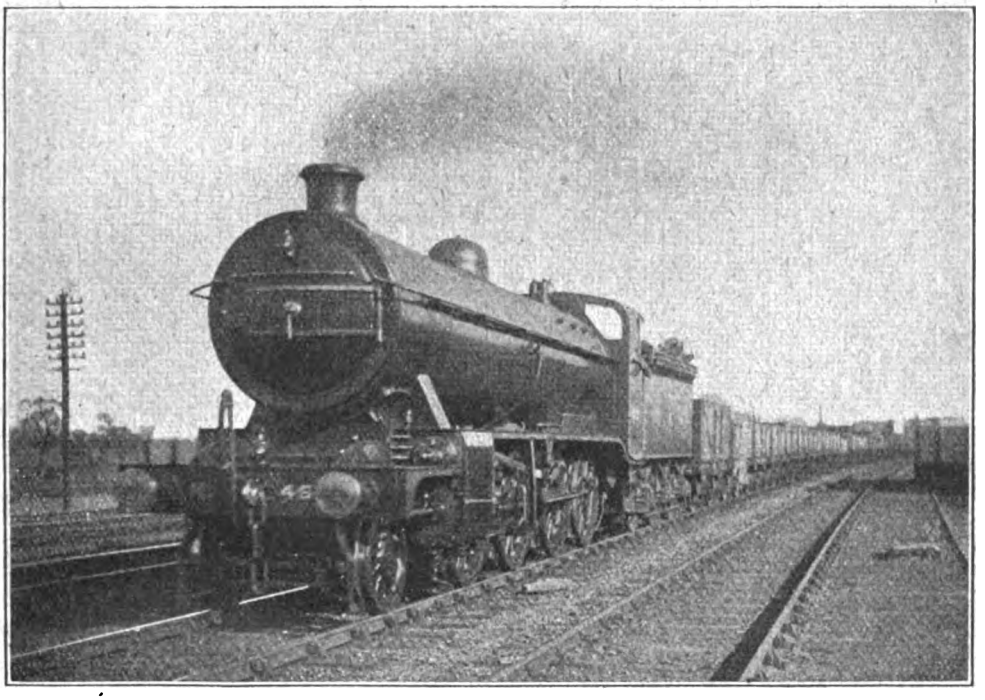
Formed in 1908, the Great Eastern Railway Musical Society is a thoroughly "live" organisation. It consists of two sections, choral and orchestral. The honorary conductor is Colonel Wm. Johnson Galloway, one of the railway's directors, and the hon. secretaries are Mr. G. G. Smithies, of the police department, for the choral section, and Mr. A. W. Headley, of the Chief Mechanical Engineer's department, for the orchestral section and general management. Since the outbreak of war the Society's usual series of concerts have been suspended, but a smaller orchestra, including members returned from war-service wounded, and others of non-military age, and assisted by ladies, is giving concerts to naval and military contingents at various places. Some 80 to 90 members have joined the Colours,



Photo] [*Chas. S. Lake.*

GREAT NORTHERN RAILWAY.
Coal train hauled by 2–8–0 type locomotive.

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and are serving in widely different parts. On Tuesday evening, May 7th, the orchestra of the above Society provided the whole of the programme at the Australian Y.M.C.A. Theatre, Aldwych, W.C. The house was packed from top to bottom, and the audience showed their appreciation in their frequent demands for encores. At the conclusion, Colonel Galloway, in reply to hearty cheers called for by Mr. Young, who has charge of the recreative work at the theatre, said that it gave them very much pleasure at all times to do anything to assist those serving with the Colours, and that they would be happy to provide another concert before long.

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MR. FRANK POTTER, General Manager, Great Western Railway, presiding at the recent annual meeting of the Railway Mission, in the Memorial Hall, Farringdon Street, London, said he knew no body of workers in the country who had a keener sense or a higher appreciation of duty than railway workers. The work of the Railway Mission was not confined to this country, branches existing both in South Africa and Japan. There was also the philanthropic side of the work in excellent convalescent homes that were kept going.

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TOTAL staff of the Midland and Great Northern Joint Railway who had joined the Colours up to the end of March was 762. Recent casualties comprise two missing (presumed dead), one died of wounds, and two others wounded.

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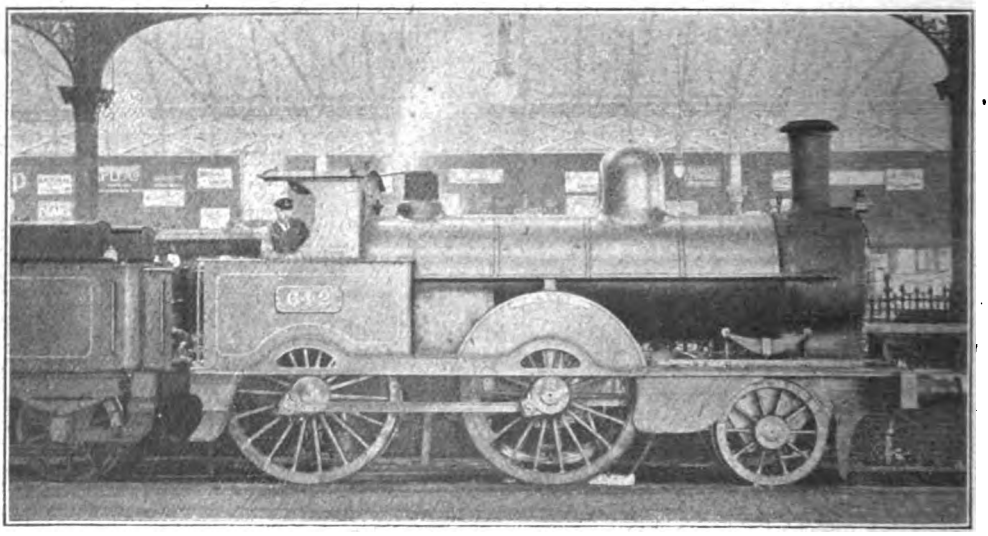
RECENTLY issued by the London, Brighton and South Coast Railway, the 17th Edition of its Roll of Honour contains the names of men who have died on active war service and the number and percentage of men enlisted. The total number of men enlisted is 4,896, which is 30 per cent. of the total employed, while 355 of this number have died on active service, which is 7·25 per cent. of the men enlisted.

* * *

A REGULAR reader of the RAILWAY MAGAZINE, Mr. W. H. Froud, writing with reference to "Roaring Rails," mentioned on page 327 of the May issue, says: "If the curious phenomenon is the same as that which I have noticed, I may say that it is very common on the Somerset and Dorset line between Wimborne (or, rather, Lake Crossing) and Corfe Mullen Junction. I have never been over that section of line without noticing the curious noise made by the train. I have never known the cause, but put it down to some peculiarity of Somerset and Dorset construction, for I have not heard it on the London and South Western Railway. I should like to know if any other RAILWAY MAGAZINE reader who has travelled over this branch has noticed it. The speed along this (single line) section is very high always, and I daresay this accentuates the 'roaring.'" Mr. Froud continues: "Also I should like to say a word or two about some engines I recently saw at Eastleigh. I was very much surprised to see being pulled out from the paint shops, London and South Western Railway 2–4–0T, No. 0314. Only three of these remain in service. I should like to know where it is usually shedded and what work it does. Other rather old engines at Eastleigh were a diminutive 0–4–0T, No. 0407, and 0–6–0's Nos. 337A, 351A, 370A, 0345 and 0371, and some of the old 4–4–0 engines, including 0136/7/8, 0141/2, 0277, 0307, 0347. It was decidedly curious to see No. 0277



Photo] [*P. F. Cooke.*

LONDON AND NORTH WESTERN RAILWAY.

2–4–0 locomotive, No. 642, *Bee*, at London Road station, Manchester.

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coupled on to No. 458 (4–6–0), waiting repairs."

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WRITING from Old Aberdeen, Mr. David L. Thomson communicates:—"Five of the new Caledonian Railway goods engines are now running; they are fitted with pop valves and Wakefield lubricators. Their numbers were previously held by small Drummond goods engines, which have been renumbered to replace some of the 25 of the type now overseas.

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FROM Bexhill Mr. K. Paton writes to the effect that six of the large superheater South Eastern and Chatham Railway 4–4–0's are now stationed at Hastings (No. 12) shed, and work the 7.40, 8.10, 9.10 a.m., 12 noon and 1.55 p.m. trains to London, returning on week-days at 1.50, 3.50, 5.5, 6 and 7.45 p.m., and at slightly altered times on Saturdays. Mr. D. H. Smart adds further shed information concerning this line to the effect that all the 0–6–4 tank engines of class J are now stationed at Bricklayers' Arms. He also corrects two slight errors which crept into the May issue, first in regard to the illustration of South Eastern and Chatham Railway 4–4–0 No. 192, which has been rebuilt with extended smokebox, but *not* with superheater, and second in connection with an answer concerning the London, Brighton and South Coast Railway "Atlantics," of which the superheater series runs from 421 to 426 inclusive, instead of 422 to 426, the total of superheater and non-superheater 4–4–2's therefore amounting to eleven. In still further reference to the South Eastern and Chatham Railway, Mr. H. C. Casserley notes that the black locomotive livery temporarily adopted on that line has been abandoned in favour of an unlined green, with large numerals; he also remarks on a similar war-time change on the London and South Western Railway to a black edging, separated from the customary green by only one fine white line. There are many changes in locomotive "fashions" nowadays.

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AT DUNSTON railway station, North Eastern Railway, has been closed for passenger train traffic, and the service of passenger trains to and from the station has been withdrawn.

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IN regard to British war-railways in France, Mr. Bonar Law recently announced in the House of Commons that there has been the necessity of building 900 miles of railway and nearly 1,000 miles of light railway in that country.

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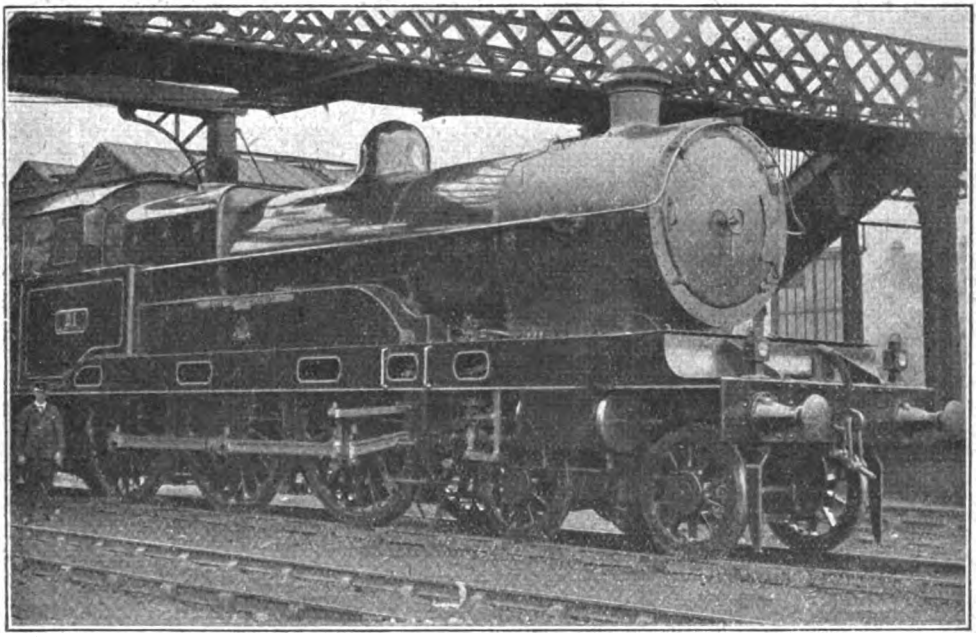
LATEST advices from the Far East are to the effect that the railway connecting British Malaya with Siam was nearing completion, and it was expected that through passenger traffic between Singapore, Kuala Lumpur, Penang and Bangkok would begin on April 1st. As a matter of fact, trains conveying high officials in both countries have already been run over the line between Kuala Lumpur and Bangkok, and it is only the



Photo] [*Chas. H. Lang.*

LONDON AND NORTH WESTERN RAILWAY.

Locomotive, No. 21, *Duke of Sutherland*, at Crewe.

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difficulty of obtaining certain ironwork that has prevented an earlier opening of the line to general traffic. One big iron bridge on the Siamese side had not been completed. The basal portion had been laid, however, and efforts are being made to get the ironwork fixed up as soon as possible. The completion of the through railway is expected to have an appreciable effect on the Federated Malay States food problems, as the Siamese authorities are anxious to send through as much rice and other foodstuffs as possible once the railway is open. Owing to the shortage of rolling stock, due to the war, the through service will be a modified one at first, and it is not likely that there will be more than one passenger train daily each way till the war is over.

* * *

THE Appropriation Account of the sums voted by Parliament, beyond ordinary grants, for all expenses arising out of the war for the year 1916–17 has been issued as a White Paper. The Votes of Credit for the year amounted to £2,010,000,000, and the expenditure to £1,962,982,432. Under the Railway Agreement the sum of £16,870,963 was paid to the Executive Committee. Of this £9,852,871 was in respect of estimated deficiencies in net receipts from February, 1916, to January, 1917, compared with the year 1913; £5,644,408 for arrears of maintenance and renewal work from August 5th, 1914, to December, 1916; £619,450 lost railway-owned ships; £538,757 interest on capital expenditure; £215,477 restoration of South Eastern Railway at Folkestone. The payments to the Executive Committee stood, on March 31st, 1916, at £12,731,833, which, added to the payments now reported, gives £29,602,796 as the total of the payments made by the Government up to March 31st, 1917.

EARLY in May it was announced by the Egyptian Railway Administration that the swing bridge over the Suez Canal at Kantara had been completed, with the result that, after May 15th there would be direct railway service from Cairo to Palestine.

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IT is questionable whether any English railway can provide a locomotive history more fascinating for those who study the subject, than does the London, Brighton and South Coast line; consequently Mr. W. R. S. Smart—of the Model Railway Club—in his paper presented to an assembly of Railway Club members at the club-house, 92, Victoria Street, London, S.W., on Tuesday evening, May 14th, had a theme that was sure to meet with approval. Mr. Smart made excellent use of his opportunities and illustrated his remarks with a particularly fine series of drawings executed by himself. An animated discussion followed the paper, and Mr. Smart was much complimented upon his work. On Saturday, June 22nd, the Railway Club will visit the London General Omnibus Training Section, Chelsea. Members will meet Chelsea station at 2.20 p.m. sharp.

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AN important agreement has been arrived at between the Railway Executive Committee and the Railway Clerks' Association, under which official recognition is given to the association for the first time as representing the clerical administrative employees of the railway service. In future no changes affecting that section of the railway staff will be arranged or authorised by the Railway Executive Committee without consultation with the association.

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